BERKELEY LAB **Lawrence Berkeley National Laboratory**

Via email and courier

February 22, 2016

Ref. No.: ES-16-050

Ms. Carmen Santos and Mr. Steve Armann
US Environmental Protection Agency, Pacific Southwest, Region 9
Land Division (LND-4-1)
75 Hawthorne Street
San Francisco, CA 94105

Subject: Transmittal of the *Application for Cleanup of Polychlorinated Biphenyls, Old Town Demolition Phase I Project*

Ms. Santos and Mr. Armann,

Enclosed for your review and approval, please find the *Application for Cleanup of Polychlorinated Biphenyls, Old Town Demolition Phase I Project* for Lawrence Berkeley National Laboratory (LBNL). This application describes the approach for the cleanup and disposal of polychlorinated biphenyl (PCB) contaminated concrete and soil in the Old Town Demolition Phase I Project area of LBNL at One Cyclotron Road in Berkeley, California.

LBNL is a United States Department of Energy (DOE) national laboratory, operated and managed by The Regents of the University of California (UC), and located on property owned by UC. This application is intended to comply with risk-based cleanup requirements defined in 40 Code of Federal Regulations 761.61(c) established pursuant to the Toxic Substances Control Act.

This application is being submitted jointly by UC and DOE. It was prepared and approved by Dynamic Management Solutions, the demolition subcontractor for the Old Town Demolition Phase I Project. The application is certified by Glenn Kubiak, Associate Laboratory Director for Operations and Chief Operating Officer at LBNL.

Please note that Appendix C, which contains the analytical and data validation reports, is provided on electronic media due to the large volume of this data.

If you have any questions or require additional information, please contact Robert Cronin at rdcronin@lbl.gov or 510-495-2849 or Kevin Bazzell at kevin.bazzell@emcbc.doe.gov or 510-486-5547.

Sincerely,

Robert Cronin
Project Director
Old Town Demolition Project
Lawrence Berkeley National Laboratory

Kevin Bazzell
Federal Project Director
Old Town Demolition Project
U.S. Department of Energy

enclosure:

Application for Cleanup of Polychlorinated Biphenyls, Old Town Demolition Phase I Project (Appendix C, "Analytical Laboratory Reports and Data Validation Reports for 2015 Sampling at Buildings 52, 52a and the Electrical Pad," provided on electronic media)

cc w/enclosure (without Appendix C) via email:

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Application for Cleanup of Polychlorinated Biphenyls

Old Town Demolition Phase I Project

February 2016

Rev.	Reason for Revision	Originator	Date	Reviewer	Date

CERTIFICATION

As required per 40 CFR Section 761.61(c), I certify that all sampling plans, sample collection procedures, sample preparation procedures, extraction procedures, and instrumental and chemical analysis procedures used to assess or characterize the PCB contamination at the Site, are on file at LBNL's offices at One Cyclotron Road in Berkeley, California and are available for EPA inspection. Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (18 United States Code [USC] 1001 and 15 USC 2615), I certify that the information contained in or accompanying this document is true, accurate, and complete. As to sections of this document for which I cannot personally verify truth and accuracy, I certify as an authorized official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate, and complete.

2/19/16

Glenn D. Kubiak — Date
Associate Laboratory Director of Operations, Chief Operating Officer
Lawrence Berkeley National Laboratory

REGISTERED GEOLOGIST
CHRISTINA J. KENNEDY
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2/19/2016

Christina Kennedy, P.G. — Date
Technical Project Manager
Dynamic Management Solutions, LLC

2/19/2016

Raoul Mebane — Date
Vice President
Dynamic Management Solutions, LLC

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Acronyms and Abbreviations

°F	degrees Fahrenheit
ALARA	as low as reasonably achievable
BAAQMD	Bay Area Air Quality Management District
BMPs	best management practices
CCR	California Code of Regulations
CAG	Community Advisory Group
CFR	Code of Federal Regulations
COC	chain of custody
DMS	Dynamic Management Solutions, LLC
DOE	Department of Energy
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control
EBMUD	East Bay Municipal Utility District
EDD	electronic data deliverable
EPA	United States Environmental Protection Agency
ERAC	Ecological Risk Assessment for Chemicals
LCS	laboratory control samples
LCD	laboratory control duplicates
LBNL	Lawrence Berkeley National Laboratory
LOQ	limit of quantitation
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
μg/kg	micrograms per kilogram
μg/l	micrograms per liter
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
NEPA	National Environmental Policy Act

NHPA	National Historic Preservation Act
NNSS	Nevada National Security Site
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
ppm	parts per million
PCB	polychlorinated biphenyl
PEC	probable effect concentration
PPE	personal protective equipment
QC	quality control
QSM	Quality Systems Manual
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
RSL	regional screening level
RWQCB	Regional Water Quality Control Board, San Francisco Bay Region
SAP	sampling and analysis plan
SSHASP	Site-Specific Health and Safety Plan
SWRCB	State Water Resources Control Board
SWPPP	Stormwater Pollution Prevention Plan
TEC	threshold effect concentration
TSCA	Toxic Substances Control Act of 1976
UC	University of California
UCL	upper confidence limit
WAA	waste accumulation area

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1 INTRODUCTION

This application describes the approach for the cleanup and disposal ("cleanup plan") of polychlorinated biphenyl (PCB) contaminated concrete, soil, and sediment in the Old Town Demolition Phase I Project area ("Site") of the Lawrence Berkeley National Laboratory (LBNL, or "the Facility") at One Cyclotron Road in Berkeley, California. LBNL is a national laboratory supported by the United States Department of Energy (DOE) and managed by The Regents of the University of California (UC). The Site is shown on Figure 1 and described in Section 1.1 below.

PCB remediation waste, as defined in Section 761.3 of Title 40 of the Code of Federal Regulations (CFR), has been identified in soil and concrete in the Old Town Phase I Project area. PCBs have been detected at maximum concentrations of 70 milligrams per kilogram (mg/kg) in concrete and 840 mg/kg in soil.

LBNL has been working with the United States Environmental Protection Agency (EPA) Region 9 PCB Coordinator to address PCBs found in building materials and soil at the Site per requirements of the Toxic Substances Control Act (TSCA), including the development of this cleanup plan. On June 26, 2015, EPA, LBNL, and DOE adopted a PCB cleanup project approval strategy "…to reach an understanding on the scope, objectives, expectations, and outcomes of the [cleanup] Project as early as possible and to document actions necessary to support this goal" (LBNL, 2015a).

The California Department of Toxic Substances Control (DTSC), with whom LBNL has worked since 1991 on a comprehensive cleanup under the Resource Conservation and Recovery Act (RCRA) of chemical contaminants, has been kept informed of formal interactions with EPA and the progress of characterization efforts.

This cleanup plan is intended to guide the removal and disposal of the PCB remediation waste in accordance with risk-based cleanup requirements defined in 40 CFR Section 761.61(c). PCB-impacted concrete and soil will be removed and properly disposed of at permitted disposal facilities. No reuse or recycling of concrete or soil generated during the cleanup will occur.

As previously discussed with EPA, the Old Town Demolition Phase I Project (described in further detail below) is currently underway, and timely implementation of this cleanup plan is critical to the success of the project. LBNL plans to begin demolition and disposal of the PCB-impacted concrete and soil in the second quarter of 2016.

1.1 Background

LBNL is in the process of demolishing selected buildings in the central section of the Facility called "Old Town." The buildings in Old Town were constructed in the 1940s and 1950s and were not built to current seismic, fire, and other safety standards. Some of these buildings have already been demolished and those remaining do not provide effective space for LBNL's current research needs.

The Old Town Demolition Project is being conducted in phases, with the first phase consisting of the following steps: demolition of Buildings 5, 16, and 16A; removal of the foundation slabs of these three buildings and the foundation slabs at previously demolished Buildings 40, 41, 52, and 52A; contaminated soil removal; and grading of the area (Figure 2).

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Figure 1. Site Location

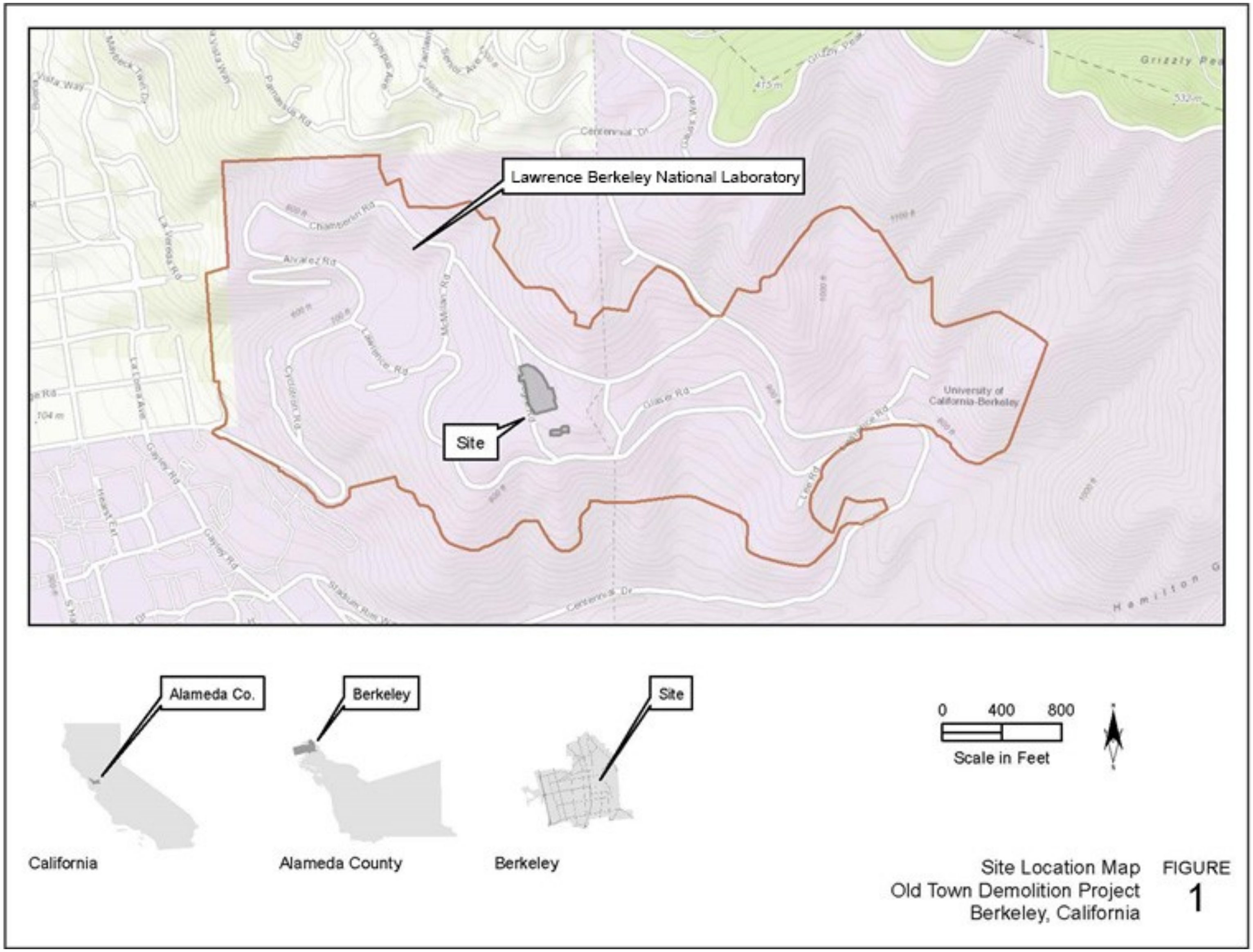
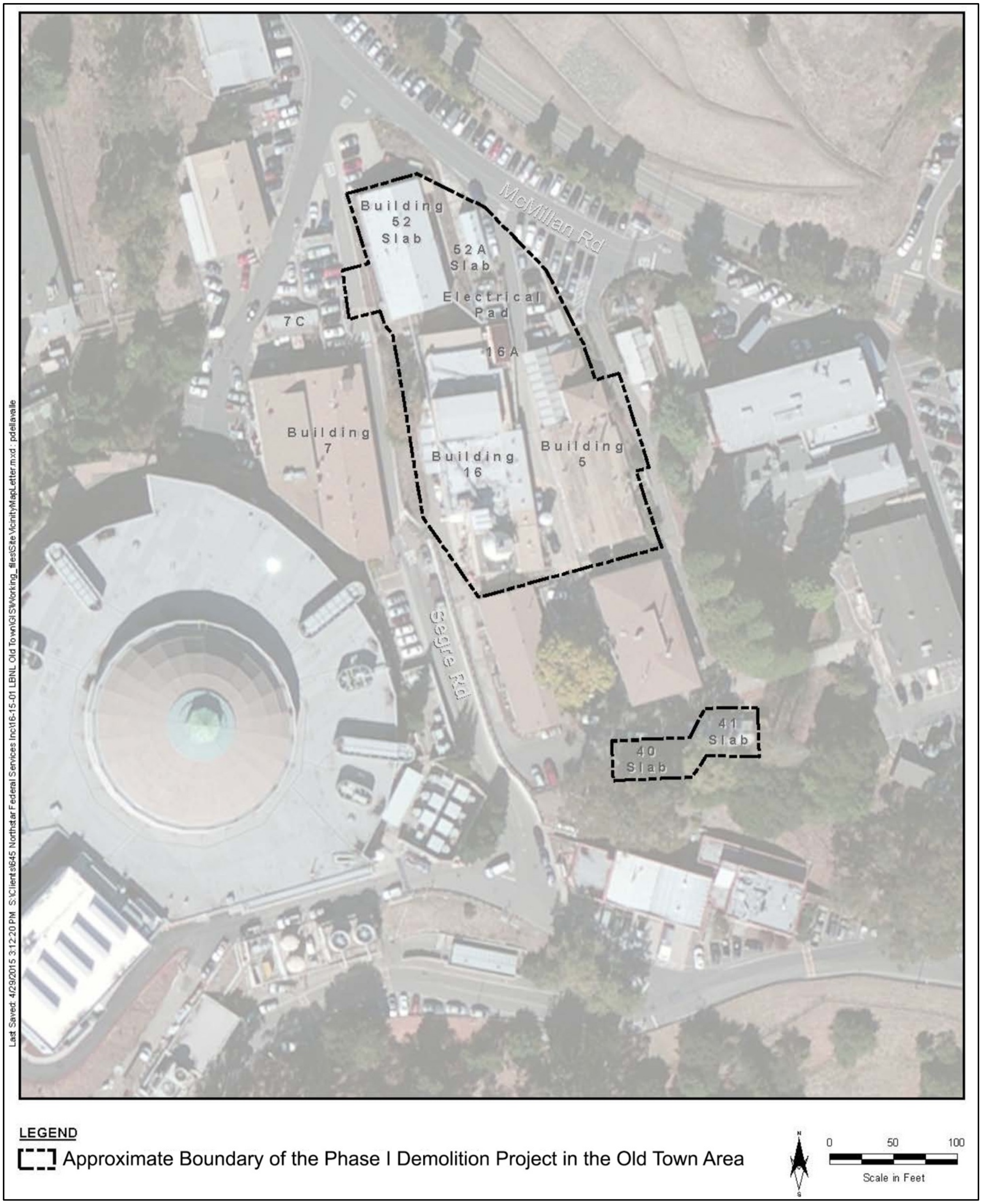


Figure 2. Site Vicinity Map



PCBs have been identified in building materials, concrete, and soil in and around Buildings 16, 16A, 52 and 52A, the electrical pad to the south of Building 52A, as well as in the storm drain system serving the Old Town area and in creeks to which the system discharges. The PCB cleanup will be conducted in stages, beginning with removal of the foundation slabs and contaminated soils at Buildings 52, 52A, and the electrical pad. The content of this application reflects this sequence and addresses the cleanup of these foundation slabs and contaminated soils. An amendment to this application, for cleanup of additional areas at the Site will follow, as PCB characterization data is collected and evaluated.

1.2 Regulatory Framework

The EPA enforces regulations implementing TSCA, promulgated at 40 CFR, Part 761. This cleanup plan is being submitted to EPA per the requirements of 40 CFR Section 761.61(c) for risk-based cleanup of PCB remediation waste. Per 40 CFR Section 761.3, areas within a cleanup site encompass "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of a cleanup of PCB remediation waste." As such, the cleanup will address areas within the Old Town Demolition Phase I Project area (Figure 2) where PCBs have been released and are currently present at concentrations that exceed the risk-based cleanup goals established and documented in this cleanup plan. (References to sections of Part 761 of 40 CFR from this point in this document omit "40 CFR.")

1.2.1 Federal Regulations for Radiological Materials and Waste

Concrete and soil in limited areas of the Site are impacted by radiological constituents. Under the Atomic Energy Act of 1954, as amended, the DOE is the federal agency that regulates the use, storage, and disposal of radiological materials at LBNL. The Atomic Energy Act authorizes DOE to protect the health and safety of the public against radiation. It is the DOE's objective to operate its facilities and conduct activities so that radiation exposures to members of the public and the environment are maintained as low as reasonably achievable (ALARA), per the requirements established in DOE Order 458.1, *Radiation Protection of the Public and the Environment*.

1.2.2 National Environmental Policy Act

In 2009, the DOE evaluated the building demolition and soil cleanup at the Site as part of an evaluation of proposed decontamination, demolition, and environmental restoration of the Old Town area pursuant to the National Environmental Policy Act (NEPA). Per 10 CFR 1021.400, the DOE NEPA compliance officer concluded that the proposed project met the requirements for a categorical exclusion and that no further environmental review was required (DOE, 2009).

1.2.3 National Historic Preservation Act

Based on a survey conducted in 2003 (Harvey, 2003), none of the structures within the Site were found to be eligible for listing on the National Register of Historic Places under the criteria in the National Historic Preservation Act. The Old Town area was also not found to be eligible for listing as a Historic District per the National Historic Preservation Act. The majority of the technological features and equipment that would convey the historic significance of the period (1943 to early 1960s) had long since been removed. The buildings themselves were found not to embody unique or significant design characteristics; and since they had been repurposed and remodeled to accommodate changing uses, were deemed not to have retained the integrity necessary to convey historic significance as defined by the Act, either individually or in the broader view of Old Town as a historic district.

No other cultural features or resources have been found at the Site.

The California State Historic Preservation Officer concurred that buildings at the Site are not eligible to be listed on the National Register, neither individually nor as a historic district (Mikesell, Stephen D., 2004).

1.2.4 State, Regional, and Local Requirements

State environmental regulatory oversight at LBNL primarily involves the DTSC, which regulates hazardous waste, and the San Francisco Bay Regional Water Quality Control Board (RWQCB), which regulates storm water discharges. In addition, the Bay Area Air Quality Management District (BAAQMD) regulates air emissions from stationary sources at LBNL. The City of Berkeley Toxics Management Division regulates hazardous material storage and on-site treatment of hazardous wastewater under the tiered permitting program. Discharges of treated water to the sanitary sewer at LBNL are regulated by the East Bay Municipal Utility District (EBMUD).

1.2.4.1 Department of Toxic Substances Control

Under the oversight of the DTSC, LBNL has conducted site investigations that indicate that volatile organic compounds, including tetrachloroethene, trichloroethene, carbon tetrachloride, and 1,1-dichloroethane, as well as petroleum hydrocarbons, PCBs, metals, and radionuclides have been released to the environment at LBNL. Some of these releases have migrated into soil and groundwater at the Facility, but have not migrated off-site. With the exception of radionuclide releases regulated pursuant to DOE's requirements, LBNL has been actively addressing those releases that pose a risk to human health or the environment under DTSC oversight.

In April 2014, LBNL notified DTSC of the presence of PCBs in soil at the Site at concentrations greater than 1 mg/kg for the sum of detected Aroclors. The DTSC has not made any requests in response to LBNL's notification. In September 2014, LBNL informed DTSC that access to the areas with PCB concentrations greater than 1 mg/kg had been restricted and that LBNL would be working with EPA on the PCB cleanup. LBNL currently meets with the EPA monthly to discuss the PCB cleanup project and its progress. All formal correspondence with EPA, including meetings notes, is shared with the DTSC. Copies of all plans and reports submitted to the EPA have been – and will continue to be – provided to DTSC. The completion report documenting the extent of excavation, confirmation sample results, and information on the disposal of any contaminated soil will also be provided.

1.2.4.2 Regional Water Quality Control Board

In August 2015, LBNL notified the RWQCB that very low concentrations (less than 0.1 mg/kg) of PCBs had been detected in creek sediments in the North Fork of Strawberry, Ravine, and Chicken Creeks, and that best management practices had been implemented by LBNL to prevent discharge of PCBs to storm drains. The RWQCB has not made any requests in response to LBNL's notification. In May 2015, LBNL notified the RWQCB that permit coverage was required for the Old Town Demolition Phase I Project under the State's General Construction Permit for storm water discharges, and coverage was granted.

1.2.4.3 Bay Area Air Quality Management District

The BAAQMD regulates emissions of toxic air contaminants, including PCBs. Emission sources that exceed trigger levels are subject to permit requirements of Regulation 2, Rule 1. Emissions that do not exceed the trigger levels do not require a permit.

The following chronic trigger levels are established by the BAAQMD for PCBs:

- 0.47 pounds per year for PCBs where PCB congeners with more than four chlorines comprise less than one-half percent of total PCBs (Low Risk); or
- 0.017 pounds per year for PCBs where congeners with more than four chlorines do not comprise less than one-half percent of total PCBs (High Risk);

No acute trigger levels have been set for PCBs.

Assessment of the demolition activities (applying conservative emission factors and the chronic trigger level of 0.017 pounds per year for High Risk PCBs) indicates that a BAAQMD permit is not required for the project.

1.2.4.4 East Bay Municipal Utility District

EBMUD will regulate discharges to the sanitary sewer of treated storm water that may accumulate in excavations and groundwater that may be extracted during the demolition activities. An EBMUD permit has been obtained by Dynamic Management Solutions (DMS), LBNL's demolition contractor, for these discharges and is included in Appendix G.

1.2.5 Community Interest

An LBNL Community Advisory Group (CAG) was formed in 2010 to provide input on LBNL's physical plans and development projects. The CAG focuses primarily on land use, community health and safety, and the environment. The group meets quarterly to discuss a variety of topics, including capital projects. The Old Town Demolition Phase I Project was initially discussed with the CAG on June 15, 2015. LBNL has provided additional updates on the project at subsequent meetings.

1.3 Scope and Applicability

This cleanup plan covers the removal and disposal of all PCB remediation waste at the Site in compliance with Section 761.61(c) and all other applicable parts of 761, such that the cleanup process, disposal, and end state are protective of human health and the environment. The cleanup plan includes contingencies to address potential PCB impacts beyond the Phase I Project boundary so that they can be properly addressed in the future (see Section 4.9).

As discussed in Section 1.1 above, this application is being submitted to EPA in stages. The application includes characterization data and a proposed approach for the cleanup and disposal of concrete slabs and soil beneath and around Buildings 52 and 52A, and the electrical pad to the east of Building 52 included in this application. An amendment to this plan will be submitted to EPA as PCB characterization of the remainder of the Site is completed. Characterization data and the proposed approach for cleanup of contaminated concrete slabs, as well as soil beneath and around Buildings 16, 16A and any other areas determined to be impacted by PCBs will be presented in the amendment. Multiple amendments may be submitted, if necessary. Information applicable to the cleanup of the entire Site, such as the field sampling methods, analytical procedures, waste disposal requirements, and a verification sampling framework, are provided herein and will be applied to PCB remediation of the Site.

1.4 Site Description and History

LBNL is located in the Berkeley and Oakland hills in Alameda County, California on approximately 202 acres of land above the UC Berkeley campus. The land is owned by the Regents of the University of California. The western three-quarters of the Facility are located in the City of Berkeley and the eastern one-quarter is located in the City of Oakland.

LBNL was formerly known as the University of California Radiation Laboratory. The Radiation Laboratory began operations as an accelerator laboratory in 1931 on the UC Berkeley campus. In 1939 the Radiation Laboratory moved to its current location with the groundbreaking for the 184-inch cyclotron (Harvey, 2003). The area of the cyclotron building (Building 6), along with adjacent support shops and laboratories to the north and east of Building 6, formed the core of LBNL's operations throughout the 1940s, and therefore, are now collectively referred to as "Old Town."

The Old Town area comprises approximately 15 acres located at LBNL's center on relatively flat terrain that was created for constructing buildings by cutting and filling the natural slopes. The footprint of the Phase I Project area is about 1 acre (Figure 2).

The Facility is bordered on the north by single-family homes and on the west by multi-unit dwellings, student residence halls, and private homes. The closest residence is located about 1,500 feet north of the Site. A Guest House, operated by LBNL, is located about 600 feet west of the Site. It provides lodging for visiting scientists and students that have business with LBNL or UC Berkeley. A typical stay is three to five nights and extended stays are usually less than six months (Zerfas, 2015).

LBNL's *2006 Long Range Development Plan* (LBNL, 2006a) designates Old Town as a "research and academic" zone. While a specific development plan is not available for the Site, it is likely that it will be developed in the future as laboratory and office space with ancillary landscaped and parking areas.

1.4.1 Ecological Resources

LBNL conducted a scoping ecological risk assessment in 1998 (LBNL, 1998). This study concluded that the central developed area of LBNL, which includes the Site, provides little or no habitat for wildlife, or less attractive habitat than perimeter areas of LBNL. No jurisdictional wetlands are located at the Facility (SAIC, 1994). Riparian areas are located in Blackberry Canyon and within the area leading into Strawberry Canyon shown as the "UCB Ecological Study Area" on Figure 3. A list of expected and observed plant and animal species at LBNL was compiled in the scoping ecological risk assessment by reviewing several site-specific and regional biological surveys. These surveys identified approximately 100 vascular plant species, 82 bird species, 23 mammal species, and 23 reptile and amphibian species that may occur on or near the site (LBNL, 1998).

Habitat protected by various environmental laws exists on the Facility:

- An area on the south-facing slope above the North Fork of Strawberry Creek (Figure 4) has been identified as a site where an arachnid called Lee's Micro-Blind Harvestman (*Microcina leei*) occurs. *Microcina leei* is listed as a "special animal" by the California Department of Fish and Wildlife. This habitat is located more than 1,000 feet from the Site.
- An approximately five-acre area at the eastern boundary is included in the United States Fish and Wildlife Service's designated critical habitat for the Alameda whipsnake (Figure 4). This snake species (*Masticophis lateralis euryxanthus*) is listed as threatened under both federal and state law. This habitat is located more than 1,000 feet from the Site.

1.4.2 Watershed

LBNL is situated within the Upper Strawberry Creek watershed. The two main creeks are the South Fork of Strawberry Creek in Strawberry Canyon and the North Fork of Strawberry Creek in Blackberry Canyon. Both creeks are perennial. Several tributaries with headwaters on or above the LBNL site discharge into the South Fork of Strawberry Creek, including Cafeteria, Ten-Inch, Ravine, Chicken, No Name, Botanical Garden, and Banana (presently referred to as Winter) creeks (Figure 3). In the vicinity of LBNL, the Upper Strawberry Creek watershed is subdivided into the Blackberry Canyon and the Strawberry Canyon Watersheds. This watershed divide passes through the Site (Figure 3).

Figure 3. Watershed and Ecological Resources at and around Lawrence Berkeley National Laboratory

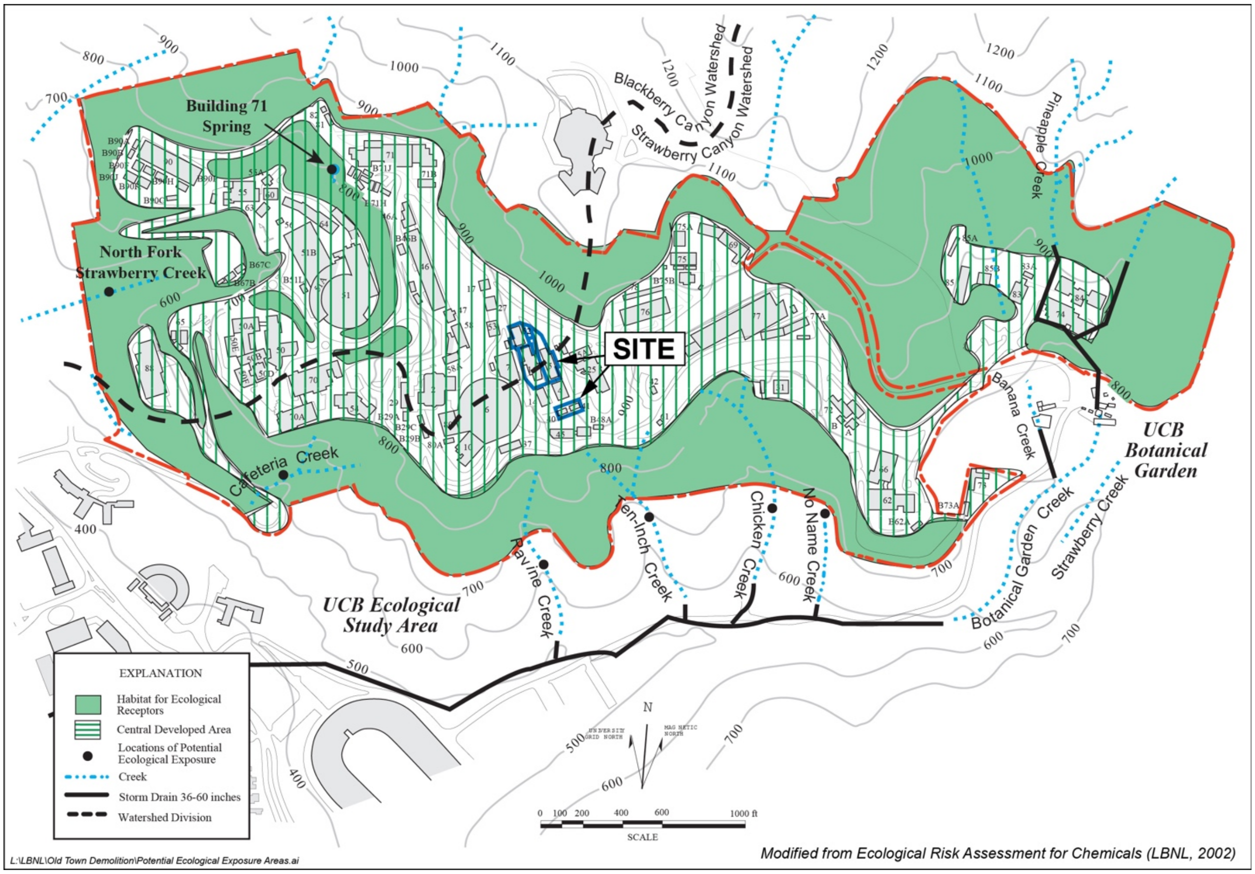


Figure 4. Protected Habitat at and around LBNL

Source: Adapted from Long Range Development Plan (LBNL, 2006)

1.4.3 Storm Water Discharges

Because of its hillside location and moderate annual rainfall, there is significant storm water runoff from LBNL. A site-wide storm drain system was designed and installed beginning in the 1960s. At the northern and northwestern portions of LBNL the system discharges to the North Fork of Strawberry Creek.

Storm water runoff from the southern and eastern portions of LBNL discharges to Chicken Creek, Ten-Inch Creek, Ravine Creek, and Cafeteria Creek, as well as to other small tributaries, and then to Strawberry Creek (LBNL, 2015d). Drainage at the Site is divided into the Blackberry Canyon and Strawberry Canyon Watersheds as shown on Figure 3, with flow in both the southward and westward directions. The storm drain network serving the area of the Old Town Demolition Phase I Project drains to Ravine Creek and Chicken Creek in the southern portion of Old Town and from the northwestern side to the North Fork of Strawberry Creek.

LBNL operates the Facility pursuant to a General Permit for Discharges from Industrial Activities (SWRCB, 2014) and requires compliance with the General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit) for projects that disturb one or more acres of soil. The Old Town Demolition Project is covered by a Construction General Permit, which requires the implementation of best management practices (BMPs) to minimize erosion and prevent transport of soil and sediment that may contain PCBs and other contaminants. Section 8.3.2 describes BMPs that will be implemented during cleanup and how these BMPs will be managed.

1.4.4 Geology and Soils

Soils at the Site form a thin (less than 10-foot-thick) veneer over the underlying bedrock. The soils have been assigned to the Xerorthents-Millsholm complex. The Xerorthents soil consists of loam and silt loam containing fragments of shale and sandstone. The Millshohm soil consists of silt loam.

Two non-marine sedimentary bedrock units are present in the project area. The structurally lowest rocks are siltstones and fine-grained sandstones of the Orinda Formation. The Orinda Formation is overlain by volcanic and volcaniclastic rocks of the Moraga Formation. Although some outcrops of Moraga Formation appear to be relatively undisturbed, most outcrops consist of loosely consolidated angular blocks of andesitic volcanic breccia, andesite, thin sandy siltstone layers, volcaniclastic gravelly sandstone, and minor basalt. Rocks found along the contact between the Moraga and Orinda Formations in many places comprise a mixture of rock types common to both the Moraga and Orinda Formations, and have therefore been mapped as the informally named “Mixed Unit.” The Mixed Unit appears to represent structurally interleaved portions of the Moraga and Orinda Formations, and not a separate stratigraphic unit.

The contact between the Orinda Formation and overlying units forms an undulatory surface with the Moraga Formation volcanic rocks and the Mixed Unit generally occupying depressions in this surface. The undulatory upper contact of the Orinda Formation is interpreted to be an eroded paleo-surface upon which the overlying volcanic rock masses may have been deposited by downslope landslide movement. Movement of such paleo-landslides would have long preceded development of the current topography and therefore has no bearing on current landslide hazards. Colluvium is present throughout much of the Site.

Figure 5 and Figure 6 illustrate the spatial relationships of the geologic units at the Site.

1.4.5 Hydrogeology

Groundwater beneath the project area is primarily present in the bedrock units. The surficial units (*i.e.*, colluvium and artificial fill) are generally above the water table throughout most of the area. Depth to groundwater ranges from approximately 10 to 25 feet below ground surface (Figure 6).

The Orinda Formation and the Mixed Unit rocks have relatively low hydraulic conductivities (on the order of 1×10^{-8} meters per second or less) while the Moraga Formation has generally higher hydraulic conductivities (on the order of 1×10^{-6} meters per second) in comparison to the underlying units. Since the Moraga Formation volcanic rock masses in the project area either crop out at the surface or are overlain by only a thin veneer of generally unsaturated colluvium or artificial fill (Figure 6), groundwater encountered in the Moraga Formation is interpreted to be unconfined. However, it is possible that deeper horizons within the low permeability Mixed Unit and Orinda Formation contain groundwater under confined conditions.

The groundwater flow direction is strongly influenced by the subsurface geometry of the contact between the Moraga Formation and underlying rocks. Groundwater flows approximately northward and northwestward at the north end of the project area, westwards near the central and southern parts of those buildings, and southwards in the vicinity of the slabs of former Buildings 40 and 41.

Figure 5. Geologic Map of Old Town Demolition Project Area

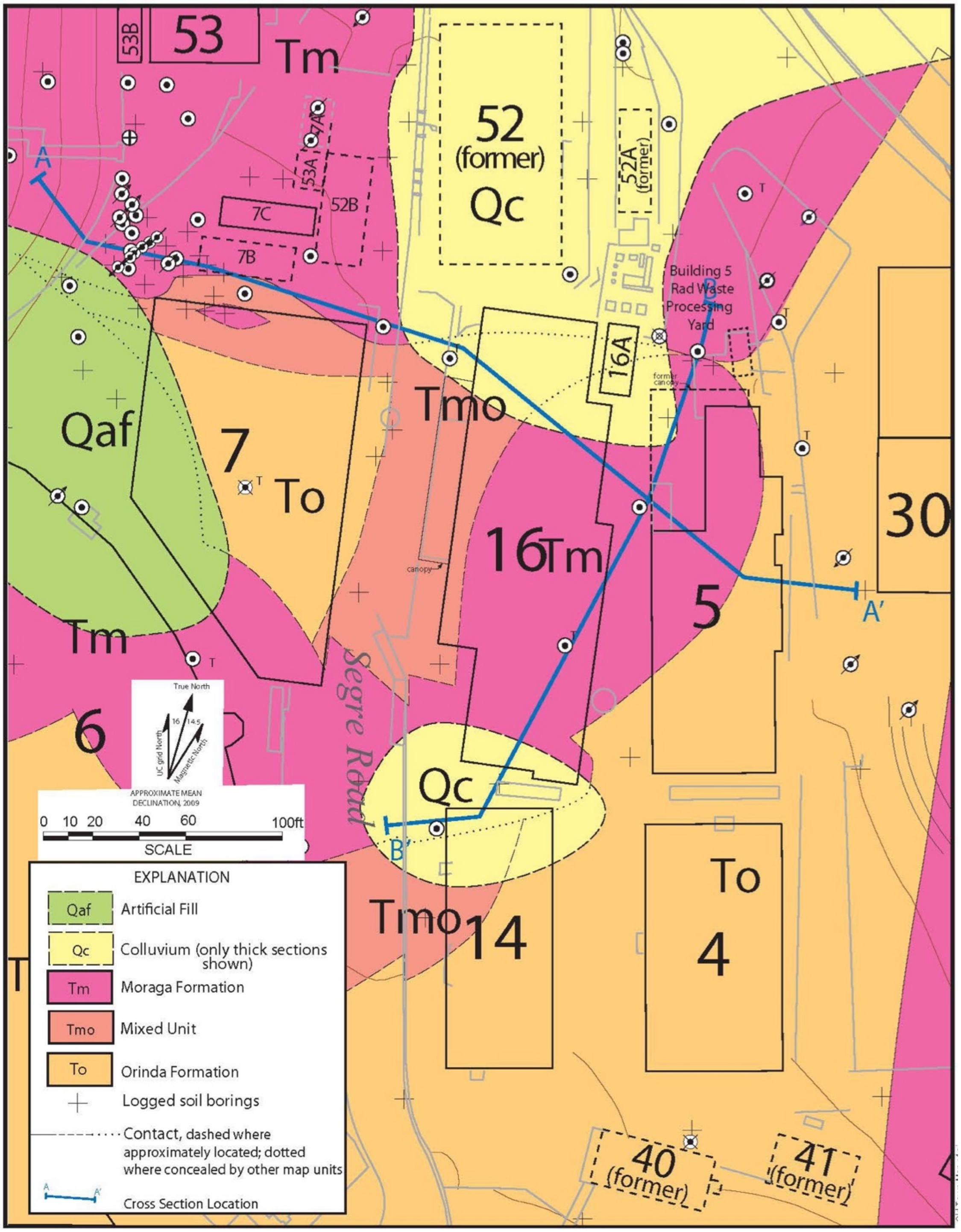
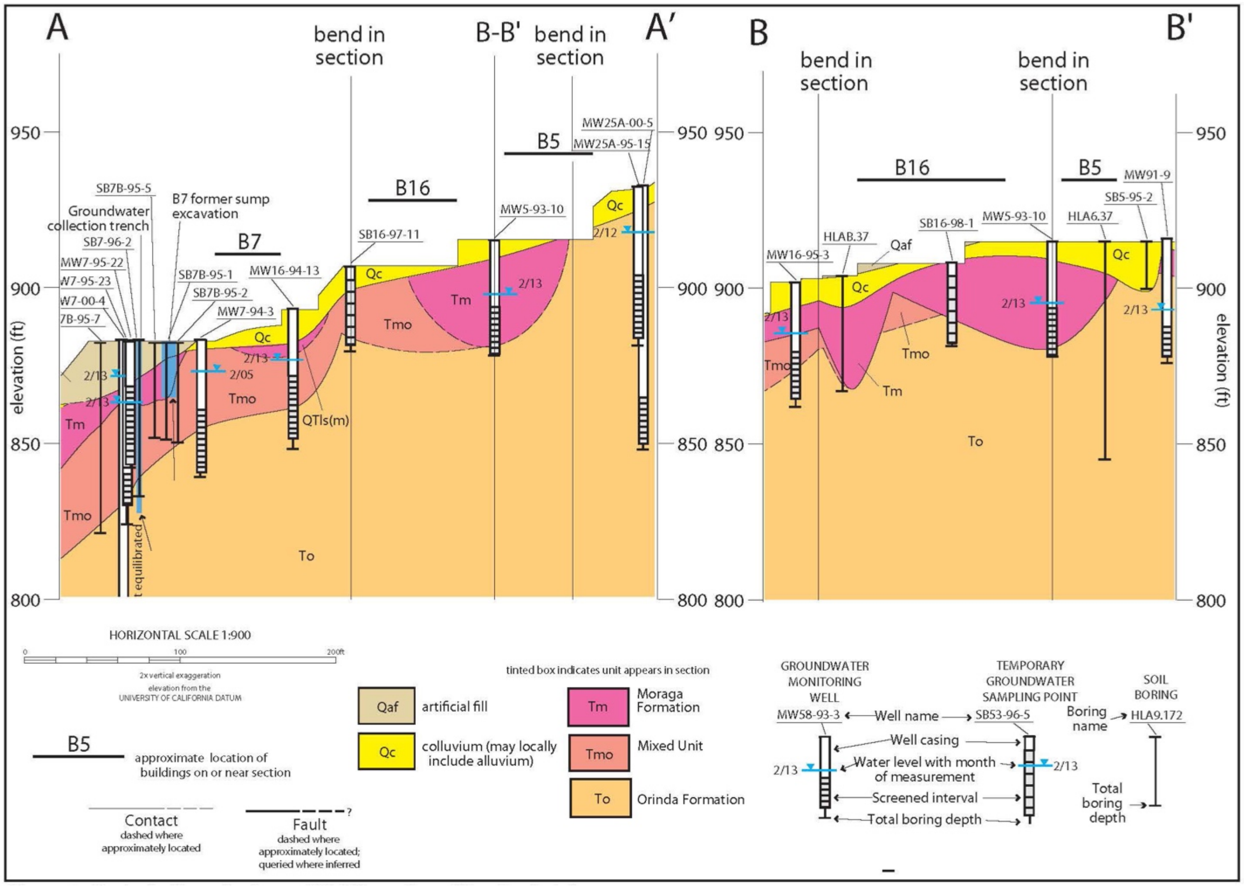


Figure 6. Geologic Cross Section of Old Town Demolition Project Area

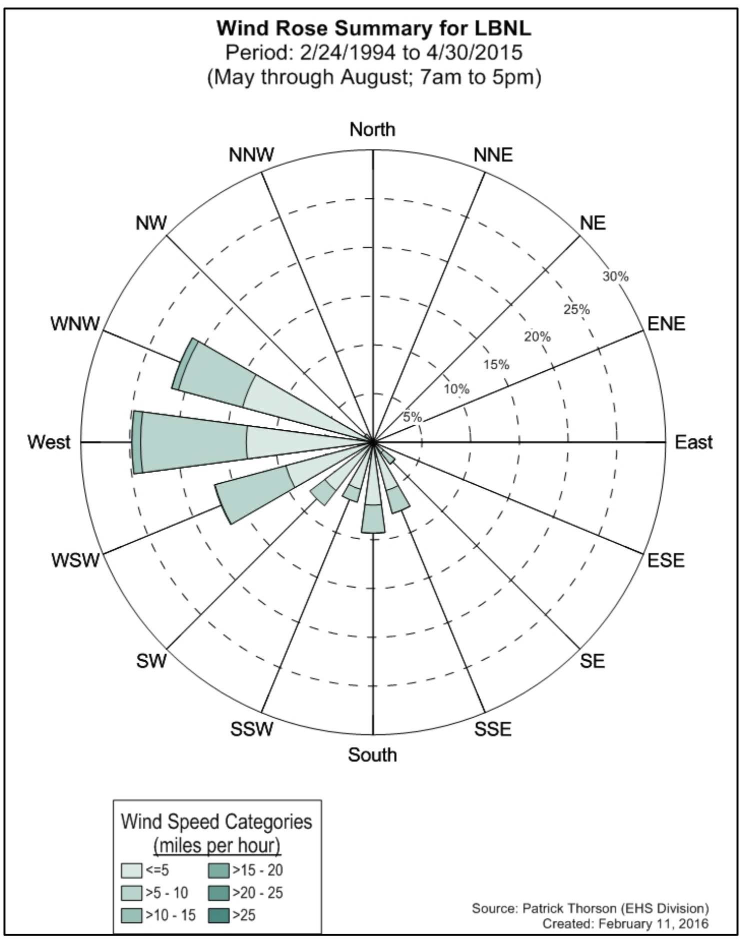


1.4.6 Weather and Climate

The climate in the area is temperate, influenced by the moderating effects of nearby San Francisco Bay and the Pacific Ocean to the west, and by the East Bay hills to the east. The winters are relatively warm and wet and the summers relatively cool and dry. The average annual temperature at the site is 55° Fahrenheit (F), with temperatures ranging from 41° to 68°F nearly 90 percent of the year. Only seldom does the maximum temperature exceed 90°F or the minimum temperature drop below 32°F. The average annual precipitation, based on 40 years of on-site measuring records, is approximately 30.5 inches.

On-site wind patterns change little from one year to the next. Figure 7 is a graphical summary – or "wind rose" – illustrating the frequency of predominant wind patterns for the past 21 years (1994 to 2015) for the months during which the demolition is expected to take place (May through August). The most prevalent wind pattern occurs during fair weather, with daytime westerly winds blowing off the bay, followed by lighter nighttime southeasterly drainage winds blowing off the East Bay hills. The other predominant wind pattern is associated with stormy weather in which south-to-southeast winds blow in advance of each system and are followed by a shift to west or northwest winds after its passage.

Figure 7. Wind Patterns at LBNL



1.4.7 Historical Uses of Old Town Buildings

The buildings constructed in the Old Town area were used primarily as research laboratories or secondary support facilities related to the 184-inch cyclotron, including craft and maintenance shops, storage facilities, and offices.

The seven buildings within the Old Town Demolition Phase I Project footprint were Buildings 5, 16, 16A, 40, 41, 52, and 52A. The superstructures of these buildings have been demolished and only the foundation slabs remain. Ancillary outdoor facilities within the Site's footprint include an electrical pad for transformers and switching gear (only the pad remains) and a former waste processing yard.

Historical uses of the buildings at the Site were described in a report summarizing the evaluation of structures in Old Town for compliance with the National Historic Preservation Act (Harvey, 2003). The discussion of the historic uses provided below is based on this report and on archival photographs (see LBNL, 2014a for photographs). As discussed in Section 1.2.3, the buildings do not quality for listing on the National Register of Historic Places.

1.4.7.1 Building 5

Building 5 was a 7,176 square-foot wood-frame and poured concrete building, also known as the "chemistry annex." The building was designed for high-level radioactive chemistry work and was constructed in 1947. The central part of the building housed various radioactive work areas and laboratories with high-level radioactive experiments ("hot" labs). The northern part was primarily used as a radioactive decontamination and waste processing facility. The building was also used for development of mercury diffusion pumps, and for a period Rooms 150 and 150A at the northern end of the building were used as a machine shop. Offices, counting rooms, and conference rooms were located at the southern end of the building. Vacuum pumps were located outside on the east side of the building.

Samples of building materials and equipment collected in 2010 and 2015 (see Section 2) showed no evidence of PCB releases in Building 5. PCB bulk products (dry wall, joint sealants, and drywall tape) were identified in Room 150 at the northern end of the building. These materials were removed prior to demolition of the building in 2015 and disposed of as PCB radioactive waste at the Nevada National Security Site (NNSS). There is no indication that would suggest that these PCB bulk products are associated with PCBs in soil at the Site.

PCBs were detected in shallow soil samples collected beyond a retaining wall on the east side of the building. The extent of the PCB contamination in this area is presently being characterized and will be addressed in an amendment to this cleanup plan.

1.4.7.2 Building 16

Building 16 was a single story wood-frame and concrete-block, slab-on-grade building constructed in phases between 1943 and the 1980s. It was originally built to house the XC Calutron magnet, a device used for uranium isotope separation experiments. Prior to demolition, the building occupied 11,771 square feet (Harvey, 2003).

Construction of the building began in 1943 but was not completed until the addition of a high bay in 1947 or 1948 to house the magnet. In May 1947, only the northern third of the current building was present and served as a carpenter shop, later becoming the machine shop. Small shop buildings, storage racks (that have been demolished), and a concrete loading dock were situated where the southern end of Building 16 is currently located. By February 1948, the main building had been constructed at the base of an unpaved slope with an approximately three-foot tall retaining wall located a few feet to the east. By

March 1950, the part of this retaining wall to the north of an electrical pad referred to as the Perkins Pad (added later) had been replaced by a 6- to 8-foot tall retaining wall. A small extension to Building 16 had also been built (Room 137A and the adjacent part of Room 125) straddling the wall between the Perkins Pad and Building 16A.

In 1959, a large 6-foot-deep pit was excavated beneath the high bay area (Room 125) in the center of the building. In 1960, Room 139 (referred to as the Perkins Pad) and its bounding retaining walls and shelter were added on to the southeast part of Building 16 to house electrical equipment (Perkins power supply). At approximately this time Building 16A, which housed transformers, was added and the area between the Building 5 roadway and Buildings 16 and 16A was paved. Room 101 was added to the south end of Building 16 in 1975 to accommodate a large vacuum chamber known as the Horton sphere. In 1981, Room 140 was added to the north end of the building to extend the machine shop.

In recent years the central part of the building housed a control room, an ion-source development area, mercury and oil diffusion pumps, chemical storage areas, electrical shops, and a wet lab. Room 110 contained a capacitor bank. An oil-filled experimental vessel and large capacitors were reportedly present in the sub-floor pit and high-bay area of Room 125. Oil diffusion vacuum pumps were used in Rooms 101 and 137. The Perkins Pad contained transformers, power supplies, and mechanical vacuum pumps with PCB-containing oils.

In 2015, various PCB bulk products (mastic and paint) and a fume hood with residual PCBs (designated as PCB remediation waste) were identified in Building 16. These materials were removed prior to demolition and sent for disposal to facilities in Kettleman City, California and Arlington, Oregon operated by Waste Management, Inc. There is no indication that would suggest that these PCB bulk products and the fume hood are associated with PCBs in soil at the Site.

PCB capacitors and other equipment containing PCB oils were also removed from the building. Oil was drained from the equipment and properly disposed of at the US Ecology facility in Beatty, Nevada. The PCB capacitors were transferred to LBNL’s RCRA facility for storage awaiting disposal.

1.4.7.3 Building 16A

Building 16A was an approximately 300 square foot, one-story corrugated metal structure. Electrical transformers that contained dielectric oil believed to have contained PCBs were historically located at Building 16A but had been removed prior to the start of the project. The building currently contains two induction regulators that were inspected in 2014. One induction regulator was determined to not contain oil. The other induction regulator was determined to contain oil but the oil did not contain detectable concentrations of PCBs (Northgate, 2014).

PCB bulk products (tape and insulation) were identified in Building 16A. These materials were removed and disposed of at Waste Management Inc.’s facility in Kettleman Hills, California prior to demolition. There is no indication that would suggest that these PCB bulk products are associated with PCBs in soil at the Site.

1.4.7.4 Building 40

Building 40 was an approximately 1,000 square foot, one-story, wood frame barracks-type warehouse with wood plank walls. The building was constructed in 1947 as a general purpose warehouse and was converted into an electronics development laboratory in the mid-1950s. It was also used for storage of electronic equipment, computers, and books by the Facilities Engineering Division.

Building 40 has been demolished and only the concrete slab floor remains. There was no indication of PCB releases in the building (see Section 2) and no PCBs were detected in samples collected from the floor of the building in preparation for demolition (Weiss, 2010).

1.4.7.5 Building 41

Building 41 was an approximately 1,000 square foot, one-story barracks-type warehouse. It was constructed of wood plank walls built on top of concrete block walls. The building was constructed in 1948 as a chemical storage warehouse. It was later converted into an electronics laboratory and subsequently into the LBNL radio shop.

Building 41 has been demolished and only the concrete slab floor remains. There was no indication of PCB releases in the building (see Section 2) and no PCBs were detected in samples collected from the floor of the building in preparation for demolition (Weiss, 2010).

1.4.7.6 Building 52

According to an evaluation of Old Town buildings, Building 52 was originally built in 1943 for use as a warehouse, shop, and a general purpose laboratory (Harvey, 2003). However, archival photos from around 1948 show construction of the building – a 6,425 square foot structure constructed of corrugated metal panel walls, a metal roof, and a concrete foundation – for installation of the Cyclodrome, a quarter-scale working model of the planned Bevatron particle accelerator. The Cyclodrome reportedly operated over a 5-month period in 1949 and was used for other testing purposes in the 1950s. Photographs of the Cyclodrome show what appear to be several large diffusion pumps located within the storage ring footprint.

During the 1950s, Building 52 housed research associated with the development in Livermore of a prototype accelerator called the Materials Testing Accelerator. By the early 1960s, Building 52 had become a general research and shop facility, and later a cable winding facility supporting research on superconducting cable wire. An approximately 8-foot deep cryostat pit with a sump was at the center of the location of the former Cyclodrome. A neutron generator was also located within the building and a small machine shop was located in the southwest corner. Capacitors that may have contained PCB-bearing oils were operated in the building. An area along the east side of Building 52 had been a hazardous materials storage area.

Trenches carrying utilities for the Cyclodrome transected the building. One of the trenches terminated at a sump on the western edge of the building. Two pipes drained the sump: a 3-inch diameter cast iron sanitary sewer line and a 2-inch diameter steel pipe that had been connected to a waste oil storage tank located at Building 52B located to the west of Building 52. This waste oil tank was abandoned in 1964 and removed in 1997. In 2014, during pre-demolition characterization of Building 52, LBNL discovered that the sewer line had been broken and may have leaked at the point at which it exited the sump (LBNL, 2000).

The superstructure of Building 52 was demolished in 2011, segments of utility trenches containing PCBs were removed in 2012 (LBNL, 2014), and only the concrete slab remains. Additional characterization indicates that the building slab contains PCBs at concentrations exceeding the risk-based cleanup goal (see Section 2 below).

1.4.7.7 Building 52A

Building 52A was a small sheet metal building used as a general storage facility. Historical photos from 1950 and 1957 indicate that the concrete pad on which the building was later constructed supported a drum rack that held horizontally stacked drums with dispensing taps. According to historical building plans, at one point the building housed a large motor generator associated with research in Building 16. The superstructure was demolished in 2011 and only the concrete slab remains. Data collected in 2015 (see Figures A-1 and A-2 in Appendix A) indicate that PCBs are present in sediment that accumulated in trenches in the building pad and in soil beneath the northern end of the building. These data are discussed in detail in Section 2 below.

2 SITE CHARACTERIZATION

Soil samples have been collected from the Old Town Demolition Project at various times, including during investigations completed in 1995, 1996, 1997, 2000, 2010, and 2011 as part of facility investigations conducted under RCRA. Results of these investigations were documented in LBNL quarterly and semiannual progress reports (LBNL 1995–2016). Samples were analyzed for a variety of contaminants, including PCBs at some locations. Samples were analyzed for PCBs by EPA Method 8082, but until August 2014, the Soxhlet extraction method (EPA Method 3540C) had not been used. A complete description of the sampling results is given in the *Preliminary Subsurface Sampling Report, Old Town Demolition Project* (LBNL, 2014a).

In preparation for the demolition of buildings in the Old Town area, LBNL completed a number of additional investigations to characterize the buildings and soils in the Phase I area for potential contaminants that would require management during the demolition and soil removal. During an investigation conducted in 2014, PCBs were detected in building floor slabs and in soils at the Site (LBNL, 2014a). Notification of a historical PCB release at Building 52 was provided to DTSC and EPA on April 28, 2014. Notification of a historical PCB release at Building 16 was provided to DTSC and EPA on June 18, 2014.

To determine the full extent of the PCB contamination, starting in 2015, LBNL's demolition contractor, DMS, began collection of additional samples of building materials and of building slabs and soils per sampling plans shared with the EPA in 2015. A summary of the results of the building materials characterization is provided in Appendix B. No PCB contamination was detected in any of the building superstructures. PCBs were detected in building materials such as caulk, sealants, mastics, and paints in Buildings 5, 16, and 16A, and these materials were disposed of as PCB bulk product waste. One fixture, a fume hood in Building 16, was found to contain PCB residue within the plenum and ducting, and this fume hood was disposed of in its entirety as PCB remediation waste in compliance with Section 761.61(b).

Following the characterization of the building superstructures, samples of the slabs and soil were collected per the *Sampling and Analysis Plan PCB Data Gaps, Concrete and Soil* (DMS, 2015a). Characterization data for the slabs and soils at and around Buildings 52, 52A, and the electrical pad, inclusive of data collected prior to 2015 by DMS, are discussed below. Characterization data for the slabs and soils at the remainder of the Site will be provided in an amendment to this plan.

The PCB data collected in the environmental investigations summarized herein has been compared to a screening level of 0.94 mg/kg for total Aroclors selected as the cleanup goal for the Site because this value represents the concentration corresponding to a human health (excess cancer) risk of one in one million (1E-06), which is deemed by EPA as the lower bound (*i.e.*, most conservative endpoint) of the acceptable risk range which is protective of human health (EPA, 2009). The selection of this cleanup goal is described in greater detail in Section 3. Waste disposal options for the demolition and cleanup of waste that will be generated were assessed by comparing the characterization data to the 50 mg/kg threshold, below which bulk remediation waste may be disposed of at a facility permitted, licensed, or registered by a State to manage non-municipal, or non-hazardous solid waste (see Section 5 for a discussion of disposal of remediation waste).

2.1 Slab Characterization at Building 52, 52A and the Electrical Pad

Samples of the concrete slabs and of sediment that had accumulated in trenches and sumps at Buildings 52, 52A and the electrical pad were collected in 2010, 2011, 2014, and 2015. During a pre-demolition survey of Building 52 in 2010, PCBs were detected in sediment that had accumulated in concrete-lined utility trenches in this building and in three of ten concrete samples collected from the trench floors. Additional samples were collected from the trench floors in 2011. In 2012, the sediment and a section of the concrete trench floor contaminated with PCBs were excavated. The sediment was disposed of at Burlington Environmental facility in Kent, Washington; the concrete was sent to for disposal to a facility in Livermore, California operated by Republic Services. No PCBs were detected in soil samples collected immediately beneath the trenches. The trenches were filled with low-strength concrete. In 2014, a 5-foot deep concrete-lined sump was discovered at the west terminus of one of the utility trenches that had been filled with the low-strength concrete. Samples of sediment and liquid that had collected in the sump contained 1,800 mg/kg and 4,500 micrograms per liter (µg/L) total PCBs, respectively. This material was removed in 2014 and disposed of at a facility in Aragonite, Utah operated by Clean Harbors Aragonite, LLC permitted to accept such waste.

During December 2015 and January 2016, additional samples were collected from concrete slabs at Buildings 52 and 52A and the electrical pad, as well as from concrete surfaces beyond the footprints of these slabs, as shown in Figure A-1 in Appendix A. Samples were also collected of sediments observed in trenches at the electrical pad and at one location on the Building 52A slab. The sample locations and results are also shown in Figure A-1 in Appendix A. The sampling was conducted in accordance with the *Sampling and Analysis Plan PCB Data Gaps, Concrete and Soil* (DMS, 2015a). One concrete sample could not be collected due to safety concerns associated with entry into the concrete-lined sump at the west terminus of a utility trench. This sample was to be collected to assess the concentration of PCBs in the concrete for the purpose of waste disposal. In the absence of sample data, the sump will be managed as PCB remediation waste at a concentration greater than 50 mg/kg and disposed of as described in Section 5.1.4.

Total PCB results from concrete and sediment samples collected at Buildings 52, 52A and the electrical pad, including historical results from concrete samples collected prior to 2015, are shown in Figure A-1 in Appendix A. The results are also summarized in Table B-1 in Appendix B. Sample results for sediment and concrete that had been removed and disposed of in 2012 and 2014 are excluded from this summary, as these data do not represent the current condition. These results had been shared with EPA in the *Sampling and Analysis Plan, PCB Data Gaps, Concrete and Soil* (DMS, 2015a). Values listed in boldface type in Table B-1 are of total PCBs detected at concentrations greater than the cleanup goal of 0.94 mg/kg. Values in shaded cells are total PCB concentrations greater than 50 mg/kg. Analytical reports and validation reports from the 2015 investigation are included in Appendix C.

These results indicate that total PCB concentrations in the concrete slab at Building 52 and electrical pad exceed 0.94 mg/kg, and in one location – a trench at Building 52 – exceed 50 mg/kg. Samples of sediment accumulated in sumps and utility trenches at Buildings 52 and 52A and the electrical pad also contain total PCB concentrations exceeding 0.94 mg/kg.

2.2 Soil Characterization at Buildings 52, 52A, and the Electrical Pad

From November 2015 through January 2016, soil samples were collected at Buildings 52 and 52A and the electrical pad in accordance with the *Sampling and Analysis Plan PCB Data Gaps, Concrete and Soil* (DMS, 2015a) and analyzed for PCBs. Minor deviations from the sampling plan were made during the investigation. A southernmost sample to the west of Building 52 (B52-SD-025) was collected approximately 7 feet west of the planned location due to obstructions and only the shallow soil was sampled due to auger refusal. This deviation did not affect the overall characterization of the area, as the modified location was sufficiently representative of the location intended to be sampled. Samples could not be collected from depths of 3 and 4 feet in boring B52-SD-008 as planned (DMS, 2015a) because gravel caved into the boring hole. A new boring was located adjacent to the abandoned one and above the Building 52/52A retaining wall.

A summary of analytical results from the concrete and soil investigation at Buildings 52 and 52A and the electrical pad is presented in Table B-1 in Appendix B. Analytical data and validation reports for these soil samples are included in Appendix C. Following is a brief overview of the results.

2.2.1 Building 52

Results of soil sampling for PCBs in the vicinity of Building 52 are illustrated on Figure A-2 in Appendix A. Concentrations of total PCBs greater than 0.94 mg/kg were detected in one sample from beneath the western edge of the building slab, in soil samples collected in an unpaved area immediately west of the slab, and beneath the roadway beyond the unpaved strip. The detections were generally limited to shallow soil (at less than 2 feet depth) and were less than 50 mg/kg, except in two locations:

1) Around a pipe described in Section 1.4.7.6, which was found to be broken at the point at which it exited a sump on the west side of the building: The maximum concentration of total PCBs detected in this area was 840 mg/kg in a sample collected approximately 2 feet from the sump at a depth of 8 feet below ground surface (boring SB52-14-20). No PCBs were detected in samples collected at depths of 12.5 feet and deeper at this location.

2) North of the southwest corner of Building 52: Surface samples collected in this area contained PCBs at concentrations up to 122 mg/kg, the maximum concentration detected in boring SB52-14-43. PCB concentrations in the samples collected at depths of 1 and 3 feet in this boring exceeded 0.94 mg/kg, but the sample collected at a depth of 6 feet contained no detectable PCBs.

Except for a single sample (SB52-14-26 shown on Figure A-2 in Appendix A) collected immediately beneath the slab adjacent to the sump discussed above, PCBs were not detected in soil beneath the building slab or in the unpaved areas south and east of the building.

2.2.2 Building 52A

Results of soil sampling for PCBs in the vicinity of Building 52A are illustrated on Figure A-2 in Appendix A. The results discussed below include those for samples collected to the east of the Building 52/52A retaining wall shown on the figure and to the north of the electrical pad. Detections of PCBs at concentrations greater than 0.94 mg/kg are generally limited to shallow soil (less than 3 feet depth).

PCBs were detected at total concentrations greater than 0.94 mg/kg in soil samples collected northwest of Building 52A and beneath a utility trench in the northwest part of the building, with the maximum concentration of 31.6 mg/kg detected in a sample collected approximately 5 feet northwest of the building at a depth of 1 foot (SB52A-14-1C). A sample collected at a depth of 3 feet at the same location contained total PCBs at a concentration less than 0.94 mg/kg.

Numerous large cracks along the margins of the utility trenches, which may provide possible conduits to the subsurface, were observed.

2.2.3 Electrical Pad

As shown on Figure A-2 in Appendix A, total PCB concentrations were less than 0.94 mg/kg in all samples collected in the vicinity of the electrical pad, except beneath a utility trench near the western edge of the pad, where 4.7 mg/kg of total PCBs were detected in boring B16-SD-058 collected at 0.5 feet beneath the trench. The utility trench was observed to be significantly cracked. The contamination detected beneath it appears to be limited to shallow soil, with total PCB concentration at 1-foot depth (the underlying sample) reported at less than 0.94 mg/kg.

2.3 Groundwater

LBNL has periodically sampled groundwater at the Site for PCBs and has detected no PCBs in groundwater (see Table 1).

In February 2015, a comprehensive investigation was conducted to assess whether the PCBs detected in soil at the Site had affected groundwater. Groundwater samples collected from 15 monitoring wells at the Site and downgradient areas were analyzed for PCBs using EPA Method 8082. No PCBs were detected in any of the samples (detection limit of 0.5 µg/L) (LBNL, 2015e; Appendix D). The absence of PCBs in Site groundwater is consistent with the low solubility of PCBs and their high sorption to soil.

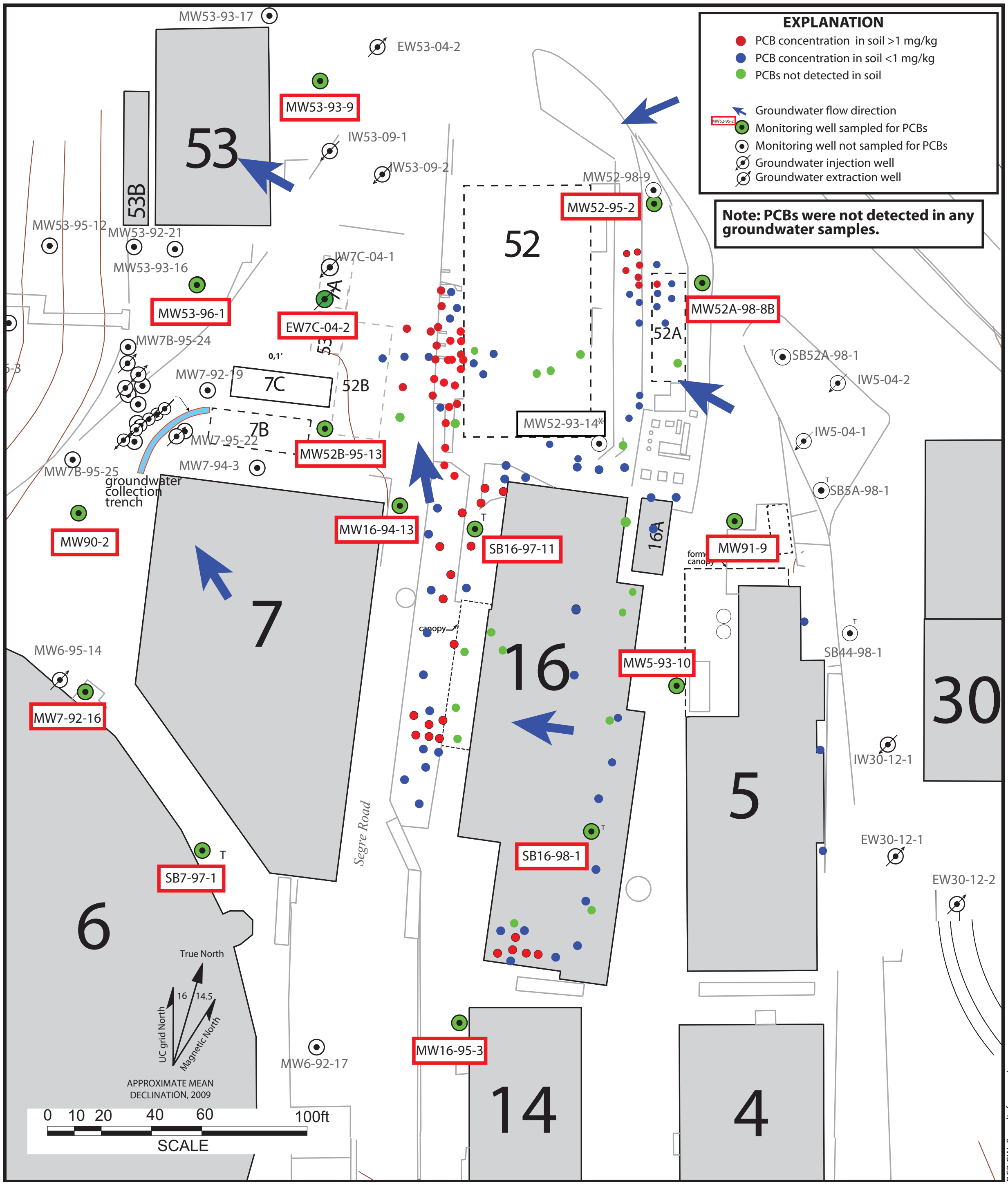
Locations of the wells sampled for PCBs are shown in Figure 8, along with the locations at which PCBs were detected in soil at the Site, and the inferred groundwater flow directions.

Table 1. Historical Results of Groundwater Monitoring at the Old Town Demolition Project Area

Well Number	Sampling Date	Result[(a)]	Detection Limit
MW5-93-10	2/11/2015	ND	0.5 μg/L[(b)]
MW7-92-16	2/11/2015	ND	0.5 μg/L
MW16-94-13	6/10/1998	ND	0.2 μg/L
	5/28/1999	ND	0.2 μg/L
	9/12/2000	ND	0.2 μg/L
	9/12/2001	ND	0.2 μg/L
	9/4/2002	ND	0.2 μg/L
	8/20/2003	ND	0.2 μg/L
	2/11/2015	ND	0.5 μg/L[(b)]
MW16-95-3	2/11/2015	ND	0.5 μg/L[(b)]
MW52-93-14	4/11/2000	ND	0.3 μg/L
MW52-95-2B	2/10/2015	ND	0.5 μg/L[(b)]
MW52A-98-8B	2/10/2015	ND	0.5 μg/L[(b)]
MW52B-95-13	12/22/1998	ND	0.2 μg/L
	9/14/2000	ND	0.2 μg/L
	9/17/2003	ND	0.2 μg/L
	8/17/2004	ND	0.2 μg/L
	8/23/2007	ND	0.2 μg/L
	2/12/2015	ND	0.5 μg/L[(b)]
MW53-93-9	2/11/2015	ND	0.5 μg/L[(b)]
MW53-96-1	2/11/2015	ND	0.5 μg/L[(b)]
MW90-2	2/11/2015	ND	0.5 μg/L[(b)]
MW91-9	2/11/2015	ND	0.5 μg/L[(b)]
EW7C-04-2	2/10/2015	ND	0.5 μg/L[(b)]
SB7-97-1	2/12/2015	ND	0.5 μg/L[(b)]
SB16-97-11	4/7/2000	ND	0.2 μg/L
	5/16/2001	ND	0.2 μg/L
	3/26/2002	ND	0.2 μg/L
	3/5/2003	ND	0.2 μg/L
	3/8/2004	ND	0.2 μg/L
	3/21/2005	ND	0.2 μg/L
	2/12/2015	ND	0.5 μg/L[(b)]
SB16-98-1	3/22/1999	ND	0.5 μg/L
	6/16/1999	ND	0.2 μg/L
	10/17/2000	ND	0.2 μg/L
	10/3/2001	ND	0.2 μg/L
	3/22/2002	ND	0.2 μg/L
	9/30/2002	ND	0.2 μg/L
	9/17/2003	ND	0.2 μg/L
	9/13/2004	ND	0.2 μg/L
	2/12/2015	ND	0.5 μg/L[(b)]

(a) Aroclors: 1016, 1221, 1232, 1242, 1248, 1254, and 1260
(b) Aroclor 1221 detection limit is 1.0 μg/L
ND: No PCBs detected.

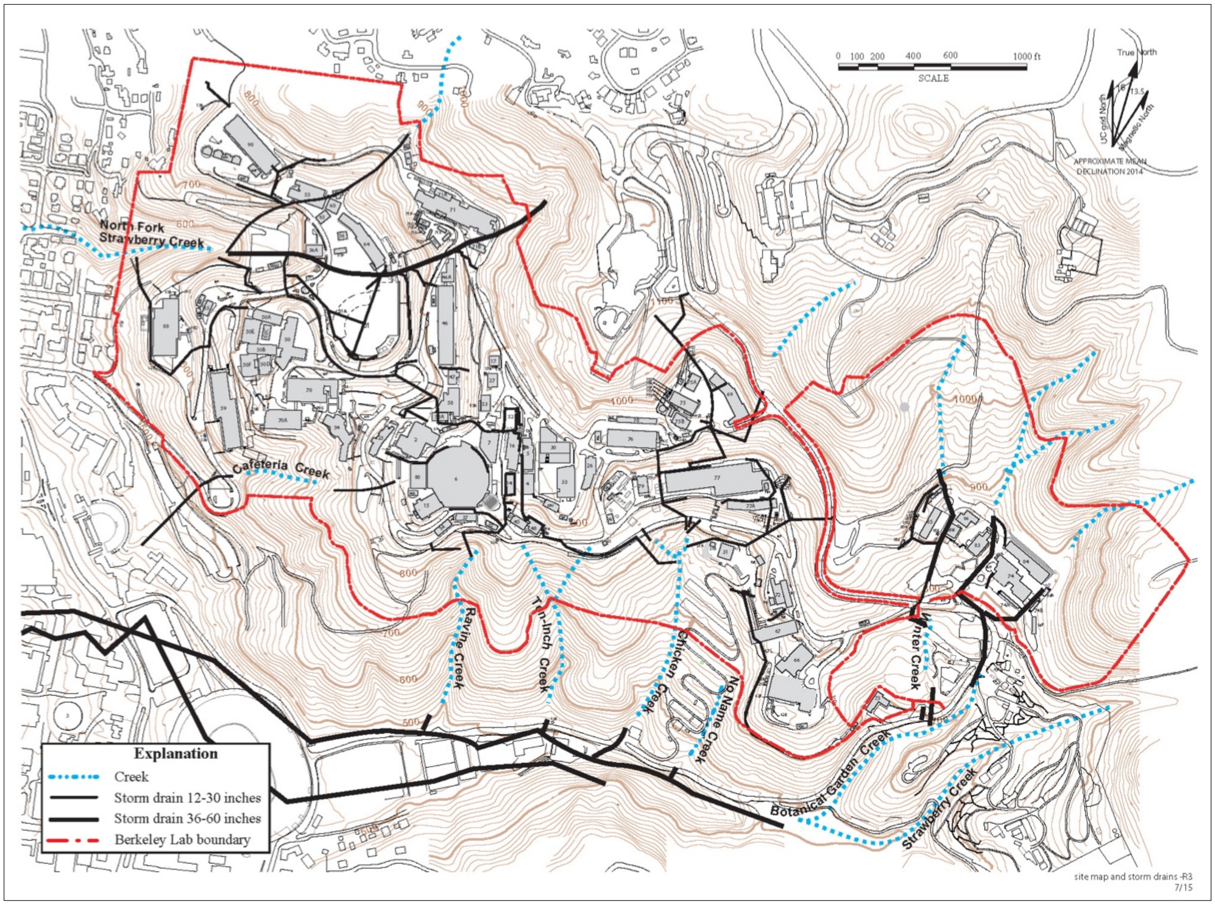
Figure 8. Locations of Groundwater Samples Collected for PCB Analysis (February 2015) Relative to Areas with Detected PCBs in Soil in 2014



2.4 Sediment in the Storm Drain System and Creeks

As discussed in Section 1.4.3, the storm drain system serving the Site drains to Ravine Creek, Chicken Creek, and the North Fork of Strawberry Creek (Figure 9). Storm water runoff from around Buildings 52 and 52A and portions of Buildings 5 and 16 flows northwest via the storm drain system to the North Fork of Strawberry Creek. Storm water runoff around portions of Building 5 drains to a segment of the storm drain system that flows southward and eventually discharges into either Ravine or Chicken Creek.

Figure 9. Major Components of the Storm Drain System and Associated Drainage



In April and May of 2015, sediment samples were collected at selected storm drain inlets along the storm drain system conveying discharges from the Site and from accessible reaches of the three creeks to which these drains discharge (Weiss, 2015). The samples were analyzed according to EPA Method 8082A with manual Soxhlet extraction by EPA Method 3540. Moisture content was measured and PCB concentrations were reported on a dry weight basis. The results of this sampling were reported to EPA, DTSC, and the RWQCB on August 26, 2015.

The PCB concentrations found in sediment samples from the storm drain inlets were compared to the composite worker (industrial) regional screening level (RSL) of 0.94 mg/kg for high risk Aroclors published by the EPA Region 9 (EPA, 2016a). As shown in Figure 10 and Figure 11, in four of the nine sediment samples collected from storm drain inlets in the Old Town Phase I Project area, concentrations of PCBs exceeded the composite worker RSL. In storm drains outside of the immediate Phase I project area, concentrations of PCBs exceeded the composite worker RSL at two locations: immediately west of the project area, (see sample OTSD-2 in Figure 10) and at on the west side of Building 58 (see sample location F in Figure 11).

Comparison of the PCB concentrations to the composite worker RSL is very conservative, as the exposure of a worker to sediments in the storm drains is limited. Exposure would only occur during occasional sample collection and cleanout of the storm drain system, which occurs on fewer than 12 days per year, or less than five percent of the exposure frequency on which the screening level is based, which is 250 days per year. At a 12-day exposure frequency, the PCB concentrations to which exposure would be acceptable would be significantly higher than the industrial screening levels.

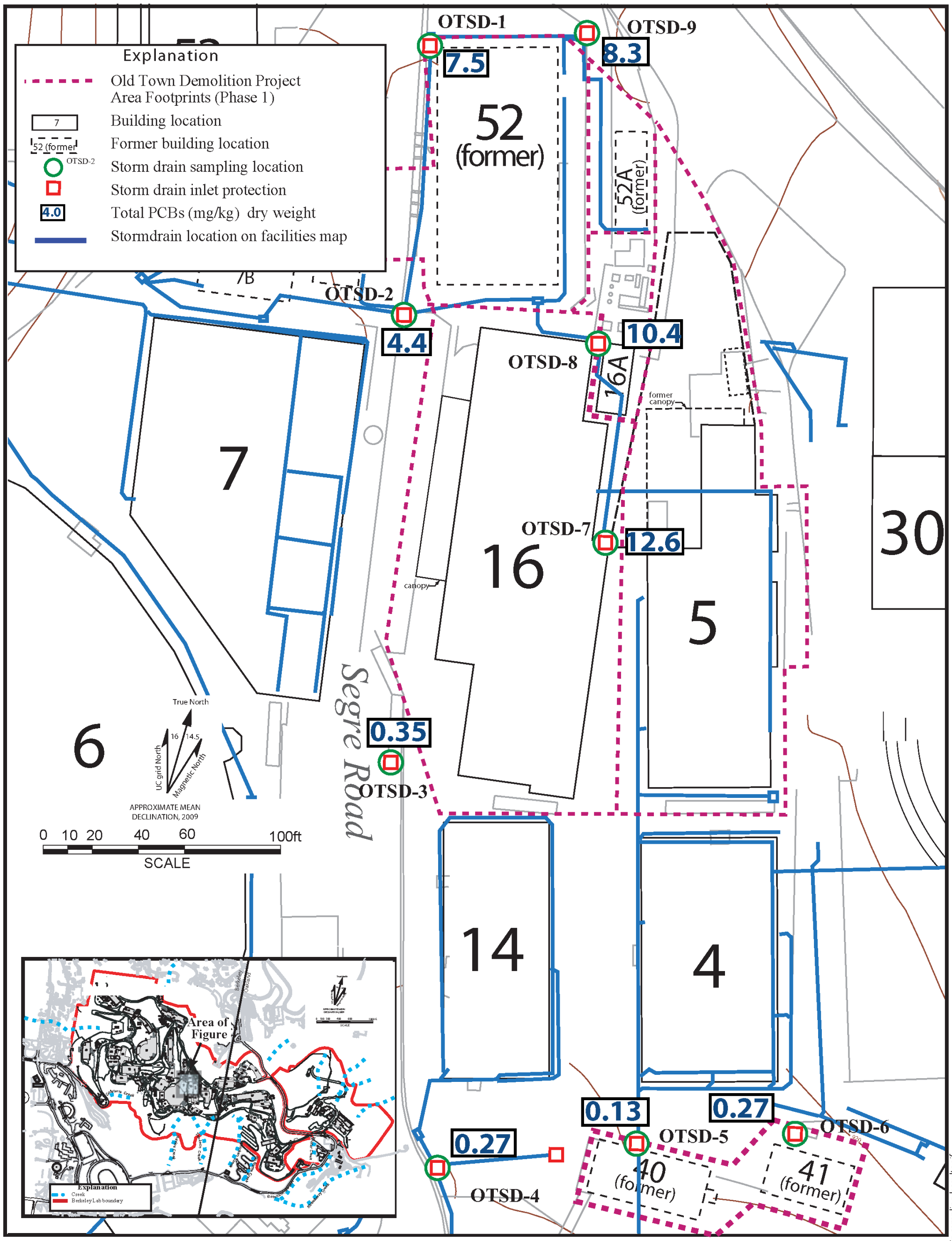
The PCB concentrations found in the creeks are shown in Figure 11. This information was provided to EPA and discussed in meetings with EPA on April 24 and May 29, 2016. The EPA reviewed the sampling results and determined that the PCB concentrations measured in the creek sediment “do not present an unreasonable risk of harm to health or the environment” (EPA, 2015a; LBNL, 2015b; and LBNL, 2015c).

The PCB concentrations detected in creek sediment were compared to the residential RSLs published by the EPA Region 9 (EPA, 2016a) to assess potential exposure of residents to PCBs in the creeks downstream of LBNL’s fenced-off boundary. Such a comparison is conservative, as any residential exposure would occur downstream of the sample locations after much of the PCB bearing sediment has settled out. All samples contained PCBs at concentrations lower than the residential RSL.

The PCB concentrations found in the creek sediment were also compared to a freshwater sediment screening level for aquatic habitat developed by MacDonald *et al.*, which is 0.0598 mg/kg on a dry weight basis for the sum of PCBs (MacDonald, 2000). This ecological screening level is not a regulatory threshold, but represents the geometric mean of several sets of sediment quality guidelines of similar narrative intent that have been integrated to yield a "consensus based" threshold effect concentration below which adverse effects are not expected to occur. The concentrations of PCBs detected in sediment deposited in the creeks exceeded the ecological screening value in samples collected at 4 of 11 locations: two at the North Fork of Strawberry Creek and two at Chicken Creek (Figure 11).

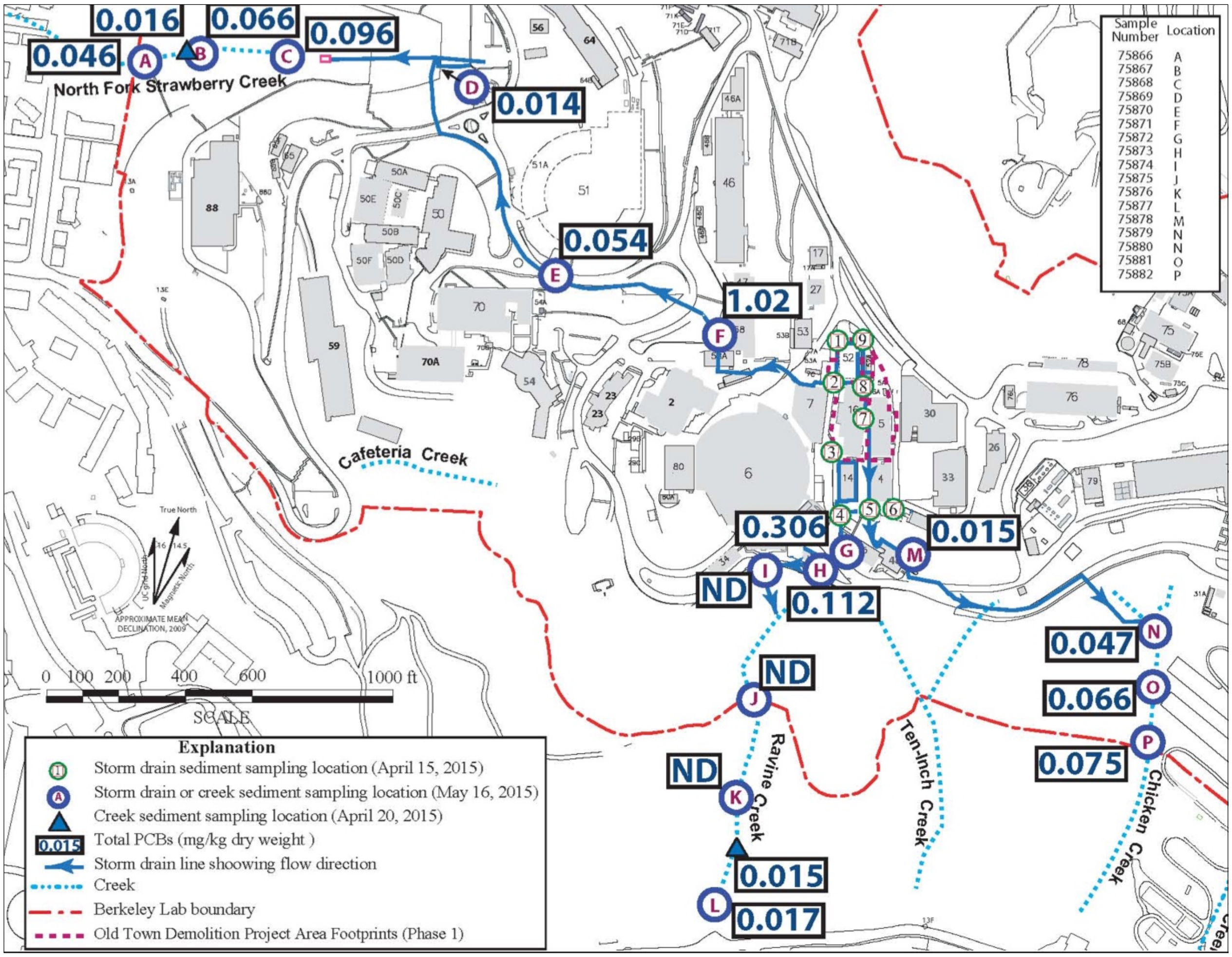
Additional detail regarding potential risks to human and ecological receptors from exposure to PCBs from the Site is provided in Section 3.

Figure 10. Concentrations of PCBs in Storm Drains at the Site



Source: Lawrence Berkeley National Laboratory

Figure 11. PCB Concentrations in Sediment Samples from Creeks and the Storm Drain System Serving the Old Town Area



Source: Lawrence Berkeley National Laboratory

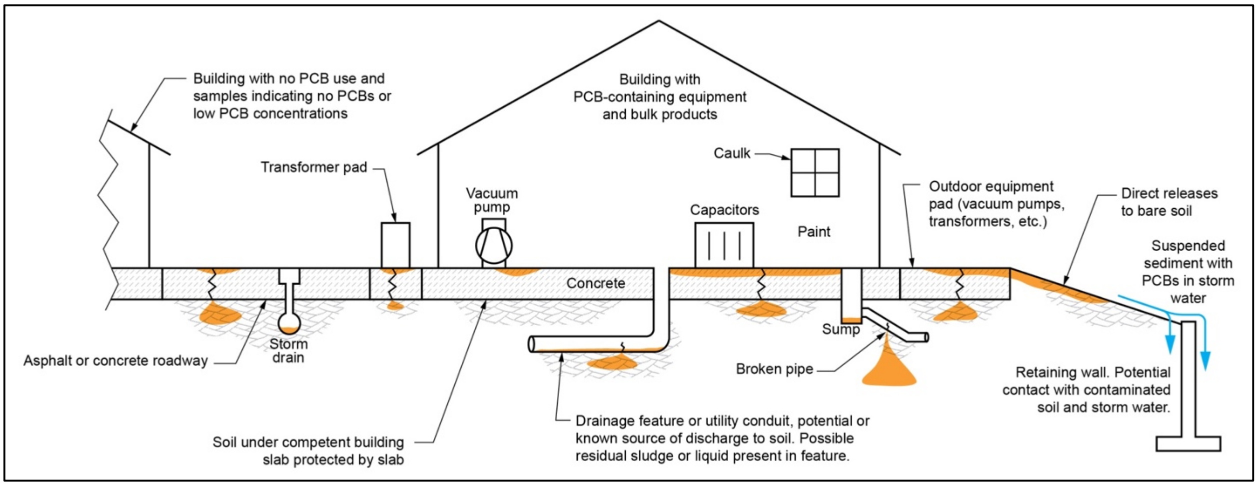
2.5 Conceptual Site Model

Results from sampling of building materials, sediment, and soil in the Phase I project area indicate that PCB releases have occurred at the Site. Informed by this sampling data, along with historical photographs from LBNL's archive, building plans, and records of personnel interviews, LBNL developed a conceptual model of potential PCB release mechanisms.

2.5.1 PCB Release Mechanisms

As shown in Figure 12, PCB releases in the project area may have resulted from oil leaks from equipment such as capacitors, vacuum pumps, and transformers, leaks from oil conveyance piping and sumps, and oil spills that occurred during equipment servicing or waste oil transfers in paved and unpaved areas. Weathering of building materials containing PCBs may have contributed to contamination of exterior concrete surfaces and/or exposed soil near the buildings.

Figure 12. Conceptual Site Model of Potential PCB Release Pathways



Equipment that contained PCB oils was located both inside and outside the buildings. Sediment sampling data from some utility trenches indicate that liquids containing PCBs may have flowed to low points in the buildings, such as concrete-lined utility trenches and sumps, and accumulated there. In some cases, PCB-containing liquids may have exited the buildings via connections of these low points to drain lines or utility conduits where broken pipes and/or breaks in the concrete could have resulted in releases to underlying soil. Soil sampling data show that PCB releases outside the buildings infiltrated into the subsurface in areas of uncovered soil.

2.5.2 Environmental Fate and Transport, Including PCB Cosolvency

Once in the environment, PCBs do not readily break down and therefore typically remain in the environment for a long time. PCBs sorb strongly to soils, particularly surficial soils with high organic carbon content. Transport mechanisms for PCBs include leaching, volatilization, and particulate transport. The leaching potential of PCBs is low, as indicated by their generally high organic-carbon partitioning coefficients. Volatilization is also a relatively minor transport mechanism due to the low vapor pressures of PCB mixtures. Particulate transport is an important migration pathway, since PCBs tend to remain sorbed to soil particles. PCBs are however soluble in organic solvents (Haasbeek, 1994), which can significantly increase the mobility of PCBs in porous media if present in large fractions.

Available data collected in soil beneath slabs that were contaminated with PCBs (*e.g.,* Building 52 and the electrical pad) show that competent concrete acts as a barrier that prevents migration of PCB spills to the underlying soil. PCBs have only been detected in soil beneath contaminated slabs where the slab had been compromised, creating a migration pathway to the subsurface soil or when PCB releases pre-date construction of the building.

The transport velocity of PCBs in soil at the Site appears to be a few inches to a foot per decade, based on the inferred age of the releases (*i.e.,* 20+ years) and the typical vertical distribution of PCBs observed in soil at the Site. While the dates of PCB releases at the Site are not documented, it is most likely that PCB releases at the Site occurred over many years, possibly starting soon after the buildings were put into service in the late 1930s and early 1940s.

Where elevated concentrations of PCBs were detected at or near the surface, except for two locations (see SB52-14-20 and SB52-14-43 on Figure A-2 in Appendix A), no PCBs are detected at depths below about

2 to 3 feet, indicating limited vertical migration of PCBs in the soil. The PCB distribution at the sump at Building 52 shows high PCB concentrations (greater than 100 mg/kg) at depths from 1 to 8 feet below the ground surface, decreasing to non-detectable levels below a depth of 12 feet (see boring SB52-14-20 on Figures A-1 and A-2). The location of this release, beneath a broken pipe exiting the sump, suggests that continued leaking of liquids from the sump enhanced the downward leaching of these liquids through the soil column and therefore may have distributed the PCBs at this location to a greater depth than has been observed elsewhere. The contact between artificial fill and underlying low permeability Orinda Formation bedrock was encountered at approximately 13 feet below ground surface at this location, and likely limited the downward migration of the PCB release.

Similarly, although PCBs were detected at a concentration greater than 100 mg/kg in the surface sample at a location west of the southern end of the building (see SB52-14-43 in Figure A-2), the PCB concentrations at this location decreased to less than the cleanup goal of 0.94 mg/kg between 3 and 6 feet below ground surface, also indicating limited vertical migration.

Erosion of surface soil impacted with PCBs and weathering of exterior building materials containing PCBs (*e.g.*, paint) may have resulted in the migration of suspended sediment containing PCBs to the storm drain system and to areas located topographically below the buildings as indicated by elevated PCB concentrations downslope of apparent release points shown in Figure A-2.

Cosolvency is not a significant transport mechanism for PCBs at the Site as indicated by the limited vertical extent of PCBs in the soil and the absence of PCBs in the groundwater (see Section 2.3). As described above, although PCBs had been released to soil over many decades, the vertical extent of the contamination is generally limited to the upper 2-3 feet of soil. If PCB mobility had been increased at the Site due to cosolvency, a greater vertical distribution of PCBs should be observed, given that the PCB releases were not from recent spills. Even if cosolvency were a factor in the mobility of the detected PCBs, it would not affect the methodology for cleanup proposed in this plan.

3 RISK SCREENING

The potential risk to human and ecological receptors from exposure to PCBs in soils at the Site was evaluated to develop a Site cleanup level that is protective of human health and the environment.

3.1 Data Inputs

Analytical results show that PCBs in concrete and soil at the Site are almost exclusively composed of Aroclors 1254 and 1260, with the exception of one soil sample that reportedly contained Aroclor 1242 and one detection of Aroclor 1268 (see Section 2 and Appendix B).

EPA Region 9 has developed an RSL and a calculator for obtaining a site-specific screening level for "high risk Aroclors," which are defined by the EPA as the sum of concentrations of Aroclors 1221, 1232, 1242, 1248, 1254, 1260, and 5460 (EPA, 2015d). Because high risk Aroclors have been detected in concrete or soil at the Site, the RSL for high risk Aroclors is an appropriate cleanup goal.

Fresh water ecological toxicity reference values for total PCBs developed as part of an *Ecological Risk Assessment for Chemicals* (ERAC) (LBNL, 2002) were used to evaluate impacts to potential ecological receptors impacted by storm water runoff from the Site. The ERAC sourced the total PCB toxicity reference values for threshold effect concentration (TEC) and probable effect concentration (PEC) from consensus-based sediment quality guidelines (MacDonald, 2000). The ERAC TEC and PEC for total PCBs are consistent with the current values listed in the National Oceanic and Atmospheric Administration Screening Quick Reference Tables (NOAA, 2015).

3.2 Human Health Exposure Assessment

Figure 13 is a conceptual site model showing the primary and secondary PCB release mechanisms at the Site and potential human exposure pathways. Although no documentation of PCB releases is available for the Site, the primary release mechanisms are hypothesized to be historical spills and releases of PCB-bearing oils from such equipment as transformers, capacitors, and vacuum pumps, and from the weathering and degradation of PCB-containing building materials. As posited in the conceptual site model, the released PCB oils are initially contained in soil, concrete, and sediment, and then may be released to air (as suspended dust particles), storm water, and groundwater. Human exposure may occur through contact with any of this media. As shown on Figure 13, no human receptors are exposed to edible biota, as the creeks near LBNL are too small to support fish populations suitable for recreational or subsistence harvesting.

For the human health exposure assessment, no residential exposure is assumed, as there are no long-term residents at the Site and no plans to house such residents. As discussed in Section 1.4, the LBNL Guest House is occupied by guests doing business at LBNL or UC Berkeley. While these guests spend the night at the Facility, their exposure is generally consistent with an indoor office worker except that their exposure durations and frequencies would be substantially lower (Table 2). Therefore, the screening evaluation of the indoor office worker's exposure will be protective of the occupants of the Guest House. The nearest off-site residential receptors are located more than 1,500 feet from the Site. Recreational exposure is also excluded, as access to the LBNL facility is controlled and only business-related activities are permitted.

Outdoor, indoor, indoor and outdoor (composite), and construction workers are identified as receptors that have potential future exposure to residual PCBs in Site soils.

Figure 13. Conceptual Site Model for Human Exposure to PCBs

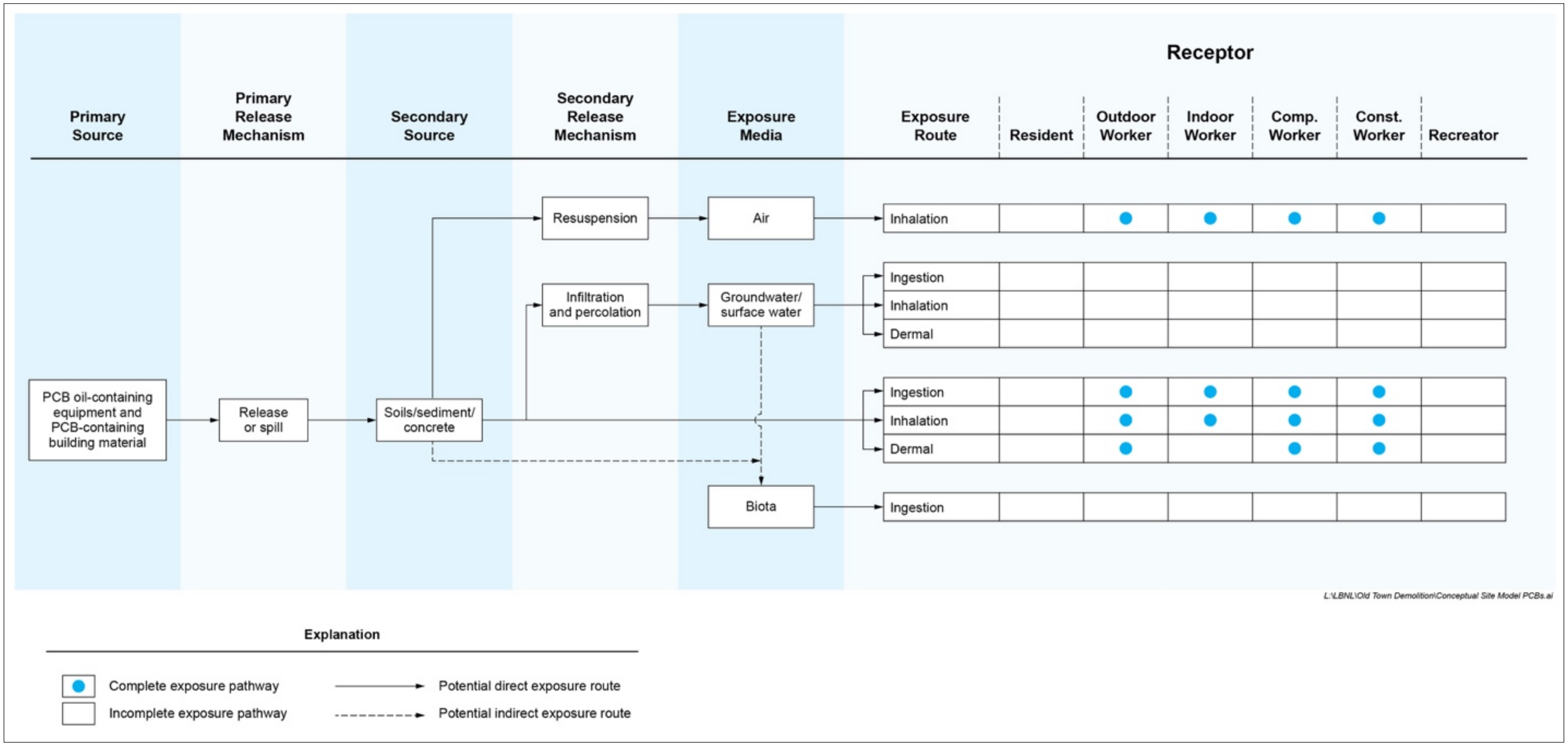


Table 2. Summary of Exposure Assumptions PCBs (High Risk)

Parameter	Outdoor Worker	Indoor Worker	Composite Worker	Construction Worker[1]
Exposure Frequency (days/year)	225	250	250	250
Exposure Duration (years)	25	25	25	1
Exposure Time (hours/day)	8	8	8	8
Soil Ingestion Rate (mg/day)	100	50	100	330
Surface Area Exposed (cm^2)	3,527	–	3,527	3,527
Adherence Factor (mg/ cm^2)	0.12	–	0.12	0.3
Body Weight (kg)	80	80	80	80
Lifetime (years)	70	70	70	70

Notes:

1. The following non-default exposure assumptions were used to calculate the screening level for the construction worker:
   A_s: 0.5 acres
   Number of cars: 20
   Number of trucks: 20
   Tons/car: 2
   Tons/truck: 40
   Source depth for volatilization: 0.5 meters
   Days with precipitation greater than 0.01 inches: 63

Abbreviations:

–	not applicable
mg	milligrams
cm^2	square centimeters
kg	kilograms

3.3 Ecological Receptor Exposure Assessment

Habitat suitable for ecological receptors was found to be only in open spaces, which are mostly located near the Facility perimeter and not at the Site, as shown on Figure 3 (LBNL, 2002). As stated in Section 1.4.1, prior assessment identified the presence of special-status plant species, nesting raptors, special-status bats, and the Alameda whipsnake at the Facility (LBNL, 2006). Habitat suitable for the Alameda whipsnake and Lee's Micro-Blind Harvestman (*Microcina leei*), both protected species, was also identified at the Facility, but is located more than 1,000 feet from the Site, as shown on Figure 4 (LBNL, 2006).

More recent environmental assessments of projects in the vicinity of the Site, within Old Town and beyond, found no impacts to federally listed or special status species or their habitat. A 2010 assessment of the environmental impacts of the proposed development of the Computational Research and Theory (CRT) facility in an area approximately 1,300 feet west of the Site – and near coastal scrub vegetation and open space grasslands along south-facing slopes to the south – found that these grasslands, although potentially containing high-quality habitat for the Alameda whipsnake, were not the core habitat and that the Alameda whipsnake has never been observed on or adjacent to that project area (DOE, 2011). The CRT project area is within the ecological habitat boundary shown on Figure 3 and not within the developed area of LBNL in which the Site is located.

A 2010 assessment of the environmental impacts of the proposed demolition of Building 25, formerly located about 100 feet southeast of the Site, found no federally listed or special status species nor suitable habitat for such species in the built environment in the Old Town area (UC, 2010). Nesting birds and raptors were found to possibly inhabit eucalyptus trees adjacent to Building 25, but these trees have been removed and no trees are present at the Site. No evidence of past or present bat roosting activity was found at the time of the field survey (UC, 2010).

The dusky-footed woodrat (*Neotoma fuscipes*), a special status animal that is active year round in forest habitats of moderate canopy and moderate to dense understory and in chaparral communities, was not expected to use non-native blue gum eucalyptus trees along the southwest portion of Building 25 or the landscaped trees located to the west of Building 25 (UC, 2010). No trees are located elsewhere on the Site, eliminating the potential for suitable habitat for this species.

Potential habitat for the Berkeley kangaroo rat, presumed to be extinct in the Oakland-Berkeley hills, occurs at LBNL, but in the undeveloped areas (UC, 2010); hence it is not anticipated to use the developed parts of the Old Town area.

Recent assessment of a project near the Site (*e.g.,* at Building 51 about 800 feet to the northwest) and in a similarly developed area concluded that the developed areas do not contain natural habitat that could support the Alameda whipsnake or special-status plant species (LBNL, 2015f).

Due to the lack of suitable habitat for federally listed or special status species at the Site, exposure for ecological receptors to PCBs from the Site is only expected to occur where PCBs have migrated from the Site to soil, sediment, surface water, or groundwater in these open spaces. Groundwater sampling indicates that PCBs have not impacted groundwater at the Site and that all of the Site soil containing PCBs is either vegetated or covered by concrete or asphalt, so there is low likelihood that re-suspended dust containing PCBs from the Site has impacted the perimeter areas of the Facility.

PCB-contaminated soil that has resulted from historical releases at the Site, although subject to additional characterization, is believed to be localized beneath and around buildings in the Old Town area. However, PCBs have been detected in sediments accumulated in the storm drain system at the Site (Figure 10) and in other areas of Old Town, as well as in the North Fork of Strawberry Creek, Ravine Creek, and Chicken Creek (Figure 11). While these creeks receive storm water discharges from the entire Facility (the Site and other LBNL areas), as shown on Figure 11, the spatial distribution of PCB-containing sediment in the storm drain system suggests that the Site is the most likely source for the PCBs found in these creeks (Weiss, 2015). As shown on Figure 11, total PCB concentrations detected in the North Fork of Strawberry Creek, Ravine Creek, and Chicken Creek in 2015 ranged from not detected (at Aroclor detection limits ranging from 0.011 to 0.023 mg/kg) to 0.096 mg/kg.

3.4 Human Health Risk Screening

Health-protective screening levels for potential future non-residential site receptors were derived by LBNL using the RSL Calculator developed by EPA for calculating human health risks (EPA, 2016b) based on a target excess cancer risk of one in one million (1E-06) per EPA's *Risk Assessment Guidance for Superfund (RAGS) Volume I: Human Health Evaluation Manual* (EPA, 2009).

Default exposure assumptions provided with the RSL Calculator and shown in Table 3 were selected for the outdoor, indoor, and composite worker. Site-specific exposure assumptions, also listed in Table 3, were developed for the construction worker. Exposure to PCBs does not have a recognized non-cancer adverse health effect per the RSL Calculator.

The screening levels derived from the RSL Calculator are listed in Table 3 for each receptor. The lowest screening level of 0.94 mg/kg for total Aroclors (for the composite worker) is selected as the appropriate cleanup goal for the Site because this value represents the concentration corresponding to a human health risk of 1E-06, which is deemed by EPA as the lower bound (*i.e.*, most conservative endpoint) of the acceptable risk range which is protective of human health (EPA, 2009). This calculated screening level is the same as the RSL for high-risk Aroclors developed by EPA Region 9 for a composite worker (EPA, 2016a).

Table 3. Calculated Screening Levels for Total PCBs in Soil

Media	Screening Levels[1]			
	Outdoor Worker[2]	Indoor Worker[3]	Composite Worker[2]	Construction Worker[2]
Soil (mg/kg)	1.0	2.5	0.94	1.4

Notes:
1. Calculated using the EPA RSL Calculator accessed February 12, 2016, for High Risk PCBs (Chemical Abstract Service No. 1336-36-3) (EPA, 2016a)
2. Soil ingestion, dermal contact, and particulate inhalation pathways.
3. Soil ingestion and particulate inhalation pathways.

Abbreviations:
mg/kg - milligrams per kilogram

3.5 Ecological Risk Screening

As discussed in Section 3.3 above, the Site is located at the center of LBNL's developed area and no federally listed or special status species are expected to inhabit the Site. However, storm water runoff from the Site, after conveyance in the subsurface storm drain system (Figure 8 and Figure 9) does have the potential to impact aquatic habitat in creeks receiving discharges from the Site and ecological receptors in the watershed could be exposed to PCBs. Exposure of terrestrial wildlife to contaminated sediments through ingestion of aquatic organisms is not considered an exposure pathway because of the lack of fish and other prey organisms (LBNL, 2002).

Ecological effects values for TEC and PEC were developed as part of the ERAC using consensus-based sediment quality guidelines (MacDonald, 2000). A TEC of 0.0598 mg/kg was established in the ERAC for the exposure of fresh water benthic organisms to total PCBs. The TEC represents a chemical concentration below which adverse effects are expected to occur only rarely.

A PEC of 0.676 mg/kg was established in the ERAC for the exposure of fresh water benthic organisms to PCBs. The probable effects value is the concentration in the media (surface water, sediment, soil) above which adverse effects to fresh water benthic organisms are expected to occur frequently.

Concentrations of PCBs in 4 of the 11 creek sediment samples collected in 2015 slightly exceeded the ERAC TEC and none exceeded the PEC (Figure 11). The presence of PCBs in these sediments appears to be related to ongoing entrainment of relatively high concentrations of PCBs from Site sources in storm water runoff. It is expected that removal and off-site disposal of Site building materials, concrete, sediment and storm drains containing PCBs, and soil with PCBs at concentrations greater than the human health screening level of 0.94 mg/kg will eventually decrease PCB concentrations in creek sediment to less than the TEC. Therefore, a soil cleanup goal of 0.94 mg/kg for total Aroclors is expected to be protective of ecological receptors in the creeks.

4 CLEANUP PLAN

This section addresses the cleanup of PCB remediation waste, mainly of concrete and soil, at the Site.

4.1 Cleanup Goals

As discussed below, consistent with the requirements of Section 761.61 (c), the cleanup will reduce PCB concentrations at the Site to levels that are protective of human health for receptors described in Section 3.4, as well as ecological receptors and groundwater quality. Per Section 761.61 (c)(2), the means and methods included in this cleanup plan are designed so that their implementation will not pose an unreasonable risk of injury to health or the environment. The goals for protection of human health, ecological receptors, and groundwater quality are described below.

4.1.1 Protection of Human Health

The objective of this cleanup plan is to provide requirements for reducing worker excess cancer risk to levels equal to or less than 1E-06. Based on the risk screening presented in Section 3 above, a soil cleanup meeting the goal of 0.94 mg/kg total PCBs reduces risks to human health to this level. Building and concrete slab removal, and removal or capping of soil with PCB concentrations exceeding 0.94 mg/kg, would create conditions that are protective for workers at the Site. Soil removal is LBNL's preferred cleanup option since it is effective and implementable. A cap would be considered as an alternative, as discussed in Section 4.9, if site conditions were to preclude removal of PCB-contaminated soil (greater than 0.94 mg/kg of PCBs).

4.1.2 Protection of Groundwater

Current site conditions appear to be protective of groundwater, as indicated by the groundwater monitoring data and the estimated migration rates of PCBs in soil discussed in Section 2.5.2. Reduction of PCB mass or capping (if required) will further reduce the potential for future groundwater impacts. Therefore, the cleanup goal of 0.94 mg/kg is deemed protective of groundwater.

4.1.3 Protection of Ecological Receptors

As discussed in Section 3, ecological receptors potentially exposed to PCBs from the Site are limited to aquatic organisms exposed to storm water discharges from the Site. Available data for creek sediment potentially receiving these storm water discharges indicate that PCB concentrations only slightly exceed the TEC no-effects threshold (see Sections 2.4 and 3.5). Therefore, removal of concrete, sediment, and storm drains containing PCBs at concentrations exceeding 0.94 mg/kg and removal or capping of soil with PCB concentrations exceeding 0.94 mg/kg are expected to reduce or eliminate further migration of PCBs to creek habitat and therefore result in conditions that are protective for ecological receptors.

4.2 Delineation of Cleanup Areas at Buildings 52, 52A, and the Electrical Pad

Sampling results discussed in Section 2 above, were used to identify areas where PCB concentrations in concrete or soil exceed 0.94 mg/kg (cleanup goal) and 50 mg/kg. Based on the delineation of areas exceeding these thresholds, plans were developed for removal and disposal of concrete and soil from Buildings 52 and 52A, the electrical pad, and surrounding areas. Figure A-3 in Appendix A illustrates the proposed extent of concrete removal, while Figure A-4 illustrates the proposed extent of soil excavation.

The details of the proposed cleanup are described in Sections 4.2.1 and 4.2.2 below. Proposed cleanup methods are described in Sections 4.4 through 4.6. PCB remediation waste with PCB concentrations less than 50 mg/kg will be segregated from remediation waste with PCBs at concentrations greater than 50 mg/kg and disposed of as described in Section 5.

4.2.1 Extent of Concrete Removal

PCBs were detected in concrete at concentrations exceeding 0.94 mg/kg in most samples collected from the Building 52 slab and the electrical pad. Consequently, these slabs (except for trenches and sump discussed below) will be removed and disposed of as PCB remediation waste at a facility permitted, licensed, or registered by a state to manage municipal, non-municipal non-hazardous solid waste (Class II landfill) in conformance with Section 761.61(a)(v)(A).

Waste from the following two locations will be disposed of at a hazardous waste landfill permitted by EPA under section 3004 of RCRA, by a state authorized under section 3006 of RCRA, or at a PCB disposal facility approved under Part 761:

1. Concrete from the utility trench in Room 109 of Building 52 with PCBs greater than 50 mg/kg, as shown in Figure A-1 in Appendix A (B52-SC-005), will be segregated from the rest of the slab.
2. The concrete sump at the end of a trench terminating on the western side of Building 52 shown in Figure A-3 will be excavated and managed as PCB remediation waste with more than 50 mg/kg of PCBs on the presumption that the concrete in the sump contains PCBs at concentrations greater than 50 mg/kg, since PCBs were detected in sediment at a concentration of 1,800 mg/kg, and in soil adjacent to the sump at a maximum concentration of 840 mg/kg. The trench leading to this sump had been removed in 2012, as discussed in Section 1.4.7.6 and shown on Figure A-1.

Approximately 1 foot of soil is expected to be removed incidental to the concrete slab removal. The soil is expected to be removed from directly beneath the slabs and from an area extending to approximately three feet beyond the slabs. Based on the analytical results, such soil will be disposed of with, and at the same facility, as the concrete.

Sections of retaining walls shown in Figure A-3 as the “Building 52/52A” and “Building 52A/Electrical Pad” retaining walls will be removed. Approximately one foot of soil from behind the retaining walls and one foot of soil from beneath the footings of these walls will be removed with the walls. The retaining wall sections and soil incidentally removed with the wall on the east side of Building 52 which contains PCBs at concentrations greater than 0.94 mg/kg but less than 50 mg/kg (see Figure A-3 of Appendix A) will be removed. The concrete and soil waste will be disposed as PCB remediation waste with less than 50 mg/kg of total PCBs (see Section 5).

Shallow soil underneath the north end of the slab at Building 52A contains PCBs at concentrations greater than 0.94 mg/kg, but less than 50 mg/kg. The concrete on top of it will be removed for disposal along with the soil as PCB remediation waste with less than 50 mg/kg of total PCBs.

4.2.2 Extent of Soil Removal

Soil will be excavated from areas within the project boundary where PCB concentrations in soil exceed 0.94 mg/kg. In addition, an area in the roadway to the west of Building 52, which is outside of the boundary, will be excavated. The areas and proposed depths of soil excavation are shown on Figure A-4 in Appendix A. In general, PCB-impacted soil will be excavated to approximately the depth that corresponds to the shallowest soil samples that contain less than 0.94 mg/kg of total PCBs. Except where noted otherwise, all excavated soil will be disposed of as PCB remediation waste with less than 50 mg/kg of total PCBs at a facility permitted, licensed, or registered by a state to manage municipal, or non-municipal non-hazardous solid waste.

Soil from two areas shown on Figure A-4 contains more than 50 mg/kg total PCBs and will be segregated during excavation for disposal at a hazardous waste landfill permitted by EPA under Section 3004 of RCRA, by a state authorized under Section 3006 of RCRA, or at a PCB disposal facility approved under Part 761.

The sump on the west side of Building 52 and the soil around and beneath it will be excavated to a depth of 13 feet or bedrock, whichever is encountered first. At the floor of the excavation the dimensions will be approximately 5 feet square. These dimensions will be maintained upward for no more than 5 feet. The upper eight feet of the excavation will be inclined to maintain slope stability. Figure A-4 illustrates the minimum outline of this excavation that can be expected. The actual extent of sloping will be determined in the field and will be dependent on soil type, soil moisture at the time of excavation, and the existing slope of the ground surface.

4.3 Site Setup

DMS personnel will complete the activities discussed below prior to commencement of PCB cleanup activities. Overhead utilities have been identified and subsurface utilities located and marked. Safety and environmental protections will be implemented as discussed in Section 8.

4.3.1 Physical Identification of Cleanup Areas

Locations of soil characterization samples were marked and surveyed by a California-registered land surveyor to obtain coordinates in conformance with the UC grid system used by LBNL. The proposed excavation limits shown in Figures A-3 and A-4 are based on results of samples collected at these surveyed locations. Based on the sample locations, the boundaries of the cleanup areas shown in Figures A-3 and A-4 will be physically marked (with stakes, flags, or paint) to delineate the concrete and soil to be removed. Areas with PCB concentrations greater than 50 mg/kg will be clearly marked (with stakes, flags, or paint) to ensure proper segregation of waste from these areas from waste generated in other locations.

A grid will be overlain on the excavation plan figure (Figure A-4) and a corresponding grid will be marked in the field to facilitate location the areas to be excavation.

4.3.2 Site Access and Layout

The Site is located in the central part of the Facility. Equipment will access the Site through the Blackberry Canyon entrance shown on Figure 14. Trucks will be staged near the waste accumulation area, also shown in Figure 14, and will be dispatched to the Site via McMillan Road. Trucks will travel to the Site one at a time to reduce traffic congestion. A truck superintendent, stationed at the truck staging area, will be in contact with the excavation crew and will dispatch the trucks when the crew is ready to load waste into them. From McMillan Road, the trucks will enter and exit the Site at its northern end.

Waste bins and containers will be staged in the waste accumulation area and will be delivered to the Site when needed for waste loading.

Figure 15 illustrates the work area at the Site. The entire work area is designated as an exclusion zone. A secure equipment lay down yard and decontamination area will be located north of the Building 52 slab.

Figure 14. Travel Route to Old Town Project

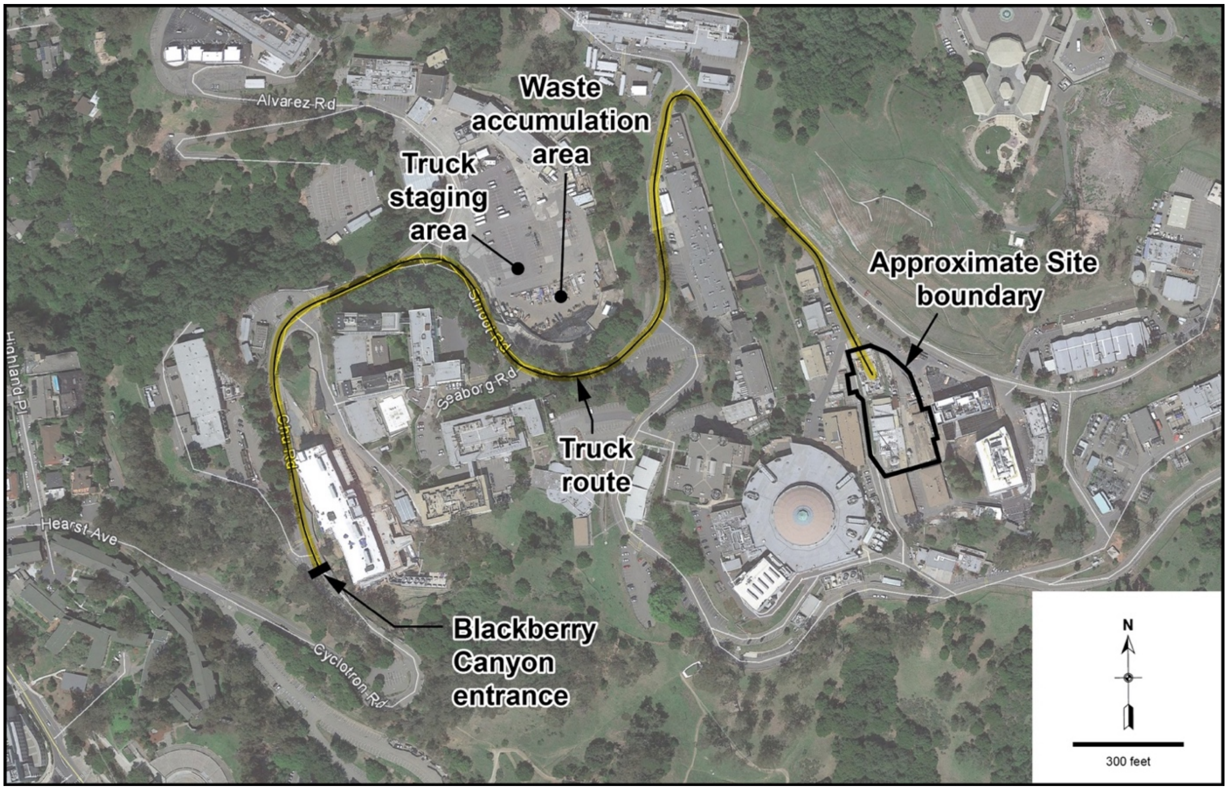
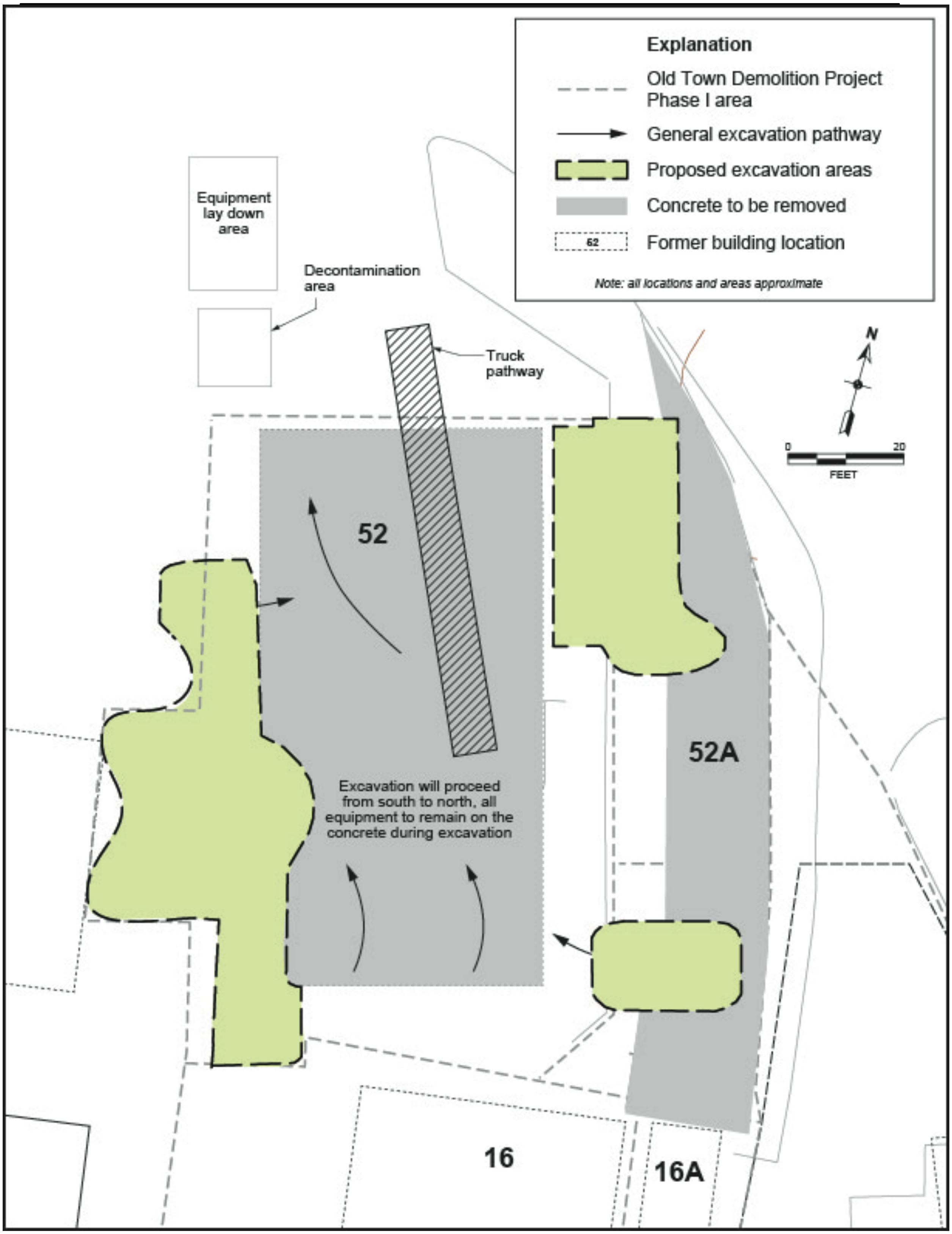


Figure 15. Excavation Site Layout



4.4 Concrete and Soil Removal

Cleanup activities will be sequenced to utilize the Building 52 pad as an equipment staging and truck loading area, allowing work to proceed from south to north toward the equipment laydown and decontamination areas. Equipment and vehicles will travel on the paved surface, thereby reducing contact with PCBs in soils and thus reducing the potential spread of contaminants.

Concrete removal and soil excavation work will be preceded by exposing known subsurface utilities. Subsurface utilities will be examined, sampled if necessary, and managed as described in Section 4.5.

Removal of the concrete slabs and soil will be conducted with an excavator fitted with any of the following tools, or others, as needed:

- **Processor:** A toothed concrete crushing attachment will be used to crush concrete into small pieces.
- **Breaker:** A large "chipper" will be used to chip concrete.
- **Jackhammer (or equivalent demolition tool):** A percussion tool that will be used to break up concrete.
- **Excavator bucket (with or without a "thumb"):** The bucket will be used to scrape up concrete debris and pick it up for loading into trucks or bins. If necessary to manage the concrete, a thumb can be attached to the bucket to facilitate picking up pieces of concrete. The bucket (without thumb) will be used to scrape or excavate soil and place it into trucks or bins.
- **Soil loader:** A loader will be used to facilitate transfer of material onto trucks or into bins.

Concrete and soil with PCBs at concentrations greater than 0.94 mg/kg and less than 50mg/kg will be directly loaded into end-dump trucks with 10- to 14-yard capacity fitted with disposable bed liners. The trucks will be covered, and the covers secured, before departing from the Site.

Concrete and soil with PCBs at concentrations greater than 50 mg/kg will be placed in lined bins conforming to the specifications of the Department of Transportation (DOT). The bins will be closed and transported to the waste accumulation area for consolidation prior to shipment for disposal.

Before the excavator transitions from work in an area with PCBs at 50 mg/kg or greater to an area with less than 50 mg/kg of PCBs, the excavator bucket or other attachment (and other equipment) that may have been in contact with the contaminated soil will be cleaned as described in Section 4.8.2 (except that wipe samples will not be collected).

After all concrete and soil is removed per the excavation plan described in Section 4.2, verification sampling will be conducted as described in Section 6. All open excavations and areas of exposed soil that may be contaminated will be managed in accordance with the requirements specified in Section 8 to ensure that workers and the environment are protected.

If verification sampling indicates that PCBs remain in soil at concentrations greater than 0.94 mg/kg, removal of additional soil may be required. If the areal extent of the elevated PCBs appears uncertain, it may be necessary to collect additional characterization data to determine how much to expand the excavation footprint. If additional soil characterization is required, soil samples will be collected (typically) within approximately 10 feet laterally and one foot vertically of the samples that show PCB concentrations greater than 0.94 mg/kg. Samples will be collected as described in Section 7 of this document.

If additional soil must be removed, the excavator will be remobilized and the impacted soil excavated and disposed as described above. After completion of all excavation work, the equipment will be decontaminated as described in Section 4.6

4.5 Removal of Storm Drain System Components and Utilities Potentially Impacted by PCBs

Storm drain system components, including pipes and inlets, within the Site will be removed as shown in Figure A-4 in Appendix A. Any segments that remain will be capped or plugged at the inlet and outlet.

Other underground utilities, such as sewer pipes, electrical conduit, and waste oil pipes are likely to be encountered during concrete demolition and/or soil excavation. Some subsurface utilities will be left in place. If these utilities are exposed, they will be examined and evaluated for potential contamination. If contamination is suspected, sampling will be conducted as described in Section 7.4. If liquids are found, they will be sampled as described in Section 7.3. Analysis for PCBs will be conducted as described in Section 9. Damaged or contaminated subsurface utilities that are to remain in place will be replaced or repaired.

Underground piping will be excavated in a manner that prevents the release of potentially contaminated liquids or sediments to the environment, which are likely to be concentrated in sags, joints, bends, and traps. Removal of the piping will be in accordance with the *General Process for the Excavation and Removal of Potentially Contaminated Underground Piping* (LBNL, 2014c), the requirements of which are included herein. The piping will be exposed utilizing hand clearing to allow for:

- Visual observation of the pipe to identify any damage or defects that could have allowed releases to the environment.
- Assessment of whether the soil around the pipe is contaminated.
- Characterization of piping and contents for waste management purposes.

Once the pipe is exposed, the following procedure will be followed to determine if liquid, sediment, or other loose material is present in the pipe and/or the surrounding soil is contaminated.

1. Soil will be cleared from all sides of the pipe so that it is completely visible;
2. Pipes will be inspected for cracks, holes, joint separation, or any other obvious damage that could allow an environmental release and these locations will be marked. Soil beneath any such defect will be sampled and analyzed for PCBs per Sections 7 through 10;
3. Pipes will be evaluated for potential PCB-containing materials. Openings such as at floor drains, cleanouts, or manholes exposed during demolition will be examined for the presence of liquids or sediment. If liquids or sediment are observed, samples will be collected and analyzed for PCBs per Sections 7 through 10;
4. Soil surrounding the pipe will be inspected for discoloration, unusual smells, liquids or other evidence of potential contamination. If potential contamination is identified, soil samples will be collected and analyzed for PCBs per Sections 7 through 10;

5. If liquid is present in the pipes, it will be removed and, while analytical results are pending, placed in a properly labelled container that meets DOT specifications for liquid PCB remediation waste (see Section 5.1.3) and transferred to the Waste Accumulation Area described in Section 5.3.2.

Once the pipes are cleared of liquids, the following process will be followed to remove the underground piping.

1. A plastic-covered lay-down area will be established onto which the piping system components will be placed prior to handling or transfer.
2. A controlled work area will be established around the pipe excavation to prevent the migration of potential contaminants from the work site into the soil or storm drains.
3. Plastic sheeting or other containment will be placed under the pipe section to be exposed such that any residue that may accidentally spill from the pipe as it is cut, repaired, removed or capped will be captured and collected.
4. The pipe will be cut or snapped (for cast iron pipes) and removed and placed in the lay-down area.
6. Once removed, the pipes will be transferred to labelled 55-gallon drums or other appropriate containers that meet DOT specifications for the waste (see Section 5.3.1). Pipes determined to be to be potentially contaminated (*e.g*., storm or sewer pipes) will be sampled and analyzed for PCBs in accordance with Sections 7 through 10 or presumed to contain PCBs at concentrations greater than 50 mg/kg.
7. Pending analysis, the containers will be stored in the waste accumulation area (section 5.3.2).

4.6 Removal of Other Subsurface Materials

Unanticipated materials or features, such as tanks, may be encountered during slab demolition and soil remediation. Additional characterization of these materials may be required to assess the potential presence and concentrations of PCBs. Such characterization will be conducted in accordance with the sampling methodology outlined in Sections 7 through 11. If materials are encountered which require sampling by a methodology not specified in this cleanup plan, the sampling will be conducted in accordance with the *Sampling and Analysis Plan for PCBs – Above Slab Building Characterization Old Town Phase I Demolition* (DMS, 2015b), which provides sampling protocols for concrete, metals, painted surfaces, insulation, wall forming materials, electrical cable insulation, and other materials. If these materials contain PCBs, they will be removed in a manner that prevents the spread of PCB contamination and placed in appropriate containers as required in Section 5.3.1. Any areas subject to soil remediation based on additional soil characterization will be subject to verification sampling as described in Section 6.

4.7 Backfilling and Site Restoration Activities

Upon acceptance of verification sampling by LBNL, DOE, and EPA as described in Section 6.3, excavations will be backfilled with clean soil. Prior to backfilling, the boundaries and depths of all excavations and the locations of all verification soil sample locations will be surveyed by a California licensed land surveyor. The survey will be performed using UC grid coordinates. The post-processing accuracy of the survey will be plus or minus 0.1 foot (horizontal and vertical).

Backfill soil will be obtained from the LBNL borrow area. Backfill soil will be brought to the Site in a dump truck and placed in the excavation using a small bulldozer. Soil will be compacted using a compactor. If needed to meet compaction specifications, the soil will be conditioned by light misting with water prior to compaction. Compaction testing will be performed utilizing a nuclear density gauge under oversight of a geotechnical engineer. Compaction under roads and former building foundations will meet 95 percent per LBNL specifications. Compaction in other areas will be 90 percent. The geotechnical engineer will provide soil compaction curves and the results of compaction testing. This documentation will be presented in the cleanup completion report described in Section 12 and retained in the project records as described in Section 14.

4.8 Equipment Decontamination

All non-disposable equipment that comes into contact with materials contaminated with PCBs will be decontaminated. Non-disposable equipment will be decontaminated prior to each use. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal per Section 5.

4.8.1 Decontamination of Sampling Equipment, Hand Tools, and Miscellaneous Small Items

Sampling equipment, hand tools, or other small items will be decontaminated in accordance with Section 761.79 (c)(2). Lightly contaminated tools may be decontaminated by swabbing surfaces with hexane, provided by the analytical laboratory in a squeeze bottle. A paper towel moistened with hexane will be used for cleaning equipment surfaces that came into contact with potential PCB-containing material.

Heavily contaminated equipment will be decontaminated as follows:

1. Assemble two decontamination buckets. The first bucket contains a detergent and potable water solution, and the second bucket is for rinsate.
2. Place all used equipment (*e.g.*, drill bits, hose for the vacuum cleaner, and utensils) in the detergent and water bucket.
3. Scrub each piece thoroughly using the scrub brush. Any powder clinging to metal surfaces should be carefully removed, especially from the twists and curves of drill bits.
4. Next, rinse each piece with water and hexane.
5. Place the rinsed pieces on clean paper towels and individually dry and inspect each piece. Note: all pieces should be dry prior to reuse.

4.8.2 Decontamination of Large Equipment

The excavator with attachments listed in Section 4.4, as well as the soil loader, will be used to remove PCB-contaminated soil and concrete and will require decontamination prior to being removed off-site, being used in areas that are not contaminated, or moved from highly contaminated areas (*e.g.*, with PCBs greater than 50 mg/kg) to less contaminated ones.

During cleanup activities, to the extent possible, the operators will assure that only the bucket or other attachments will come in contact with impacted concrete and soils. Efforts will be made to avoid contact of the excavator tracks, undercarriage, or excavator arm with contaminated concrete and soils.

After removal of soil and debris from the equipment and sweeping of the excavation area, the equipment will be moved to the decontamination area. The buckets and the attachments, and, if necessary, other parts of the equipment will be decontaminated over a washing container or a bermed containment pad large enough for the equipment compatible with the cleaners used. The decontamination will be conducted in accordance with Sections 761.79 (c)(2)(i) and 761.375 as follows:

1. **First wash:** Cover the entire surface with concentrated or industrial strength detergent or non-ionic surfactant solution. Contain and collect all cleaning solutions for proper disposal. Scrub rough surfaces with a scrub brush or scrubbing pad, adding cleaning solution such that the surface is always very wet, such that each 900 cm^2 (1 square foot) is washed for 1 minute. Wipe smooth surfaces with a cleaning solution-soaked disposable absorbent pad such that each 900 cm^2 (1 square foot) is wiped for 1 minute. Wash any surface greater than 1 square foot for 1 minute. Mop up or absorb the residual cleaner solution and suds with a clean disposable absorbent pad until the surface appears dry. This cleaning should remove any residual dirt, dust, grime, or other absorbent materials left on the surface during the first wash.
2. **First rinse:** Rinse off the wash solution with 1 gallon of clean water per square foot and capture the rinse water. Mop up the wet surface with a clean, disposable, absorbent pad until the surface appears dry.
3. **Second wash:** Cover the entire surface with hexane or other organic solvent in which PCBs are soluble to at least 5 percent by weight. Contain and collect any runoff solvent for disposal. Scrub rough surfaces with a scrub brush or disposable scrubbing pad and solvent such that each 900 cm^2 (1 square foot) of the surface is always very wet for 1 minute. Wipe smooth surfaces with a solvent-soaked, disposable absorbent pad such that each 900 cm^2 (1 square foot) is wiped for 1 minute. Any surface greater than 1 square foot shall also be wiped for 1 minute. Wipe, mop, and/or sorb the solvent onto absorbent material until no visible traces of the solvent remain.
4. **Second rinse.** Wet the surface with clean rinse solvent such that the entire surface is very wet for 1 minute. Drain and contain the solvent from the surface. Wipe the residual solvent off the drained surface using a clean disposable absorbent pad until no liquid is visible on the surface.

The following will be recorded in a bound field logbook for decontamination of all equipment: description of the equipment decontaminated, a description of the estimated level of contamination, the date and time of the decontamination, names of persons conducting the decontamination process, detergents and solvents used in the process and a signed certification from the field superintendent that the above stated process was properly followed. These records will be managed according to the requirements described in Section 14.2.

The steps described above are consistent with the self-implementing procedure in Section 761.79(c)(2)(i) and no sampling is required to confirm adequate decontamination if this process is followed. As an alternative, the process may be modified as follows, if sampling is conducted to confirm adequate decontamination: the second wash and rinse may be conducted using a concentrated or industrial strength detergent or non-ionic surfactant solution instead of an organic solvent if followed by collection of wipe samples to confirm that the decontamination has been successful. Approval of this alternative is hereby requested per Section 761.79(h).

The wipe sample collection will be performed per Section 761.123 and the wipe sampling procedure enclosed in Appendix E. Prior to excavation activities, the dimensions of the excavator and loader buckets, undercarriage, tracks, arm, and attachments will be obtained to determine the number of samples required to confirm that the equipment has been adequately decontaminated. Samples will be collected to represent 1 square meter of the surface area of the equipment. Sample locations will be selected to represent locations with the greatest likelihood of contamination (*i.e.,* the inner surface of the excavator bucket, near the teeth, metal in contact with soil or concrete). If the surfaces do not meet the cleanup level of less than 10 micrograms per 100 square centimeters (10 $\mu g/100\ cm^2$), such surfaces will be re-cleaned and resampled as described above.

Pending results from the wipe sampling, the bucket and other attachments will be detached from the excavator or loader and stored in the equipment lay down area on, and covered with, clean plastic sheeting.

Decontamination rinsate will be treated, along with storm water and groundwater removed from excavations, to remove PCBs and other contaminants before it is discharged to the sewer in accordance with a special discharge permit from EBMUD. Prior to discharge, the wastewater will be sampled and analyzed for PCB congeners and will only be discharged if the discharge limit of 0.017 µg/L required by the permit can be met (see Section 5 and Appendix G).

Solids or sludge generated from decontamination activities will be sampled and analyzed for PCBs per Sections 7 through 10 or presumed to contain PCBs at concentrations greater than 50 mg/kg (see Section 5 for characterization of multiphasic waste). This waste will be placed in 55-gallon drums or other appropriate containers meeting the DOT specifications for this type of waste and will be transferred to the waste accumulation area described in Section 5.3.2.

4.8.3 Decontamination of Wastewater Treatment System

The decontamination wastewater system includes various elements, including large equipment (21,000-gallon water storage tanks), smaller equipment (200-300 gallon totes, carbon filter housings, pumps) and disposable elements (hoses, filters and carbon filter media) as shown in the schematic drawing provided with the permit in Appendix G. The disposable elements will be sampled and disposed according to Table 4 in Section 5.

Smaller elements of the wastewater treatment system will be decontaminated as described in Section 4.8.1. Larger pieces of equipment such as the tanks and totes will be decontaminated as described in Section 4.8.2 with one exception. Any sediment and sludge accumulated in the 21,000-gallon holding tanks will be removed (see Section 5.1) and the tanks will be washed and rinsed. Wipe samples will be collected at accessible locations that are expected to be most contaminated, such as the fluid outlet at the bottom of the tank where solids will collect. Two wipe samples will be collected within a one-square-meter area around the outlet.

4.9 Contingency Approach for Managing Unanticipated PCB Contamination

Unanticipated PCB contamination may be discovered during the cleanup. Such contamination will be managed as discussed below.

4.9.1 Cleanup beyond Designated Cleanup Area

If new areas of PCB contamination beyond the cleanup area delineated as described in Section 4.2 above were to be identified as a result of characterization activities included in this cleanup plan (*e.g.,* beneath building slabs, during removal of underground utilities, etc.), LBNL may proceed with removal of the contaminated soil or debris, provided that verification sampling is conducted in a manner consistent with Section 6.3.

4.9.2 Inaccessible Areas

If areas identified in this plan as requiring cleanup are found to be inaccessible, LBNL will provide to EPA a written summary of the conditions that preclude access to the area for cleanup prior to ceasing work in the general vicinity. After EPA's concurrence, a land surveyor licensed in California will survey the inaccessible area boundary using the UC grid system. The inaccessible area will be demarcated from the area(s) that have been cleaned up by a permeable geotextile, such as Tencate Mirafi N-Series nonwoven polypropylene geotextile or similar. The geotextile will be installed along the side(s) and/or bottom of the excavation in the areas at which the excavation could not be completed.

If required to protect human health and/or the environment and feasible, LBNL may permanently cap the inaccessible area(s) (see Section 4.9.4), implement alternative institutional or engineering controls, or develop a final cleanup approach for submittal to EPA as an addendum to this cleanup plan. The surveyed locations of the inaccessible areas will be documented in the Cleanup Completion Report. Institutional controls discussed in Section 13 may be required to manage such areas.

4.9.3 Temporary Fencing or Capping

Temporary fencing or capping may be required if a significant project delay were to prevent completion of the cleanup and conditions were to require isolation of the cleanup areas or portions thereof to protect human health and/or the environment. Fencing will be used in areas with residual PCB concentrations of less than 50 mg/kg.

Any fences installed will be designed to prevent unauthorized access to the impacted area and signage stating that unauthorized access is prohibited would be posted. Fencing will be installed in combination with storm water BMPs required to prevent sediment entrained in storm water runoff from leaving the contaminated area(s). The areas will be inspected weekly to ensure that BMPs are in place and remain protective of human health and/or the environment.

Should cleanup in areas where residual PCB concentrations exceed 50 mg/kg be temporarily suspended, a temporary cap will be installed. The performance objective for the temporary cap will be to prevent human exposure, infiltration of water, and dispersion of contaminated soils via wind and water erosion. LBNL and its contractor will specify materials for that cap that would meet the performance objectives. The cap will be maintained for the expected duration of the delay. The temporary cap will be inspected weekly, and any defects will be documented and repaired in a timely manner. Repairs will be required to begin within 72 hours of discovery of any breaches that could impair the integrity of the cap.

4.9.4 Permanent Capping

While permanent capping is not anticipated, if permanent capping were installed it must conform to the requirements of Section 761.61(a)(7). Consistent with this section, the cap shall consist of asphalt or concrete at least 6 inches thick, or soil at least 10 inches thick. Per Section 761.61(a)(7), the cap "must be of sufficient strength to maintain its effectiveness and integrity during the use of the cap surface which is exposed to the environment." The cap shall be inspected regularly and repairs shall begin within 72 hours for any breaches that would impair the integrity of the cap.

Additionally, the cap must meet the closure and post-closure requirements included in 40 CFR 264.310(a) which include:

1. Providing long-term minimization of migration of liquids through the closed landfill.
2. Functioning with minimum maintenance;
3. Promoting drainage and minimize erosion or abrasion of the cover.
4. Accommodating settling and subsidence so that the cover's integrity is maintained.
5. Having a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

The cap must also comply with permeability, sieve, liquid limit, and plasticity index parameters in Section 761.75(b)(1)(ii) through (b)(1)(v).

A deed restriction may be required to be recorded should a permanent cap be installed for protection of human health and the environment. The specific requirements for such a deed restriction are discussed in Section 13.

4.10 PCBs Exceeding the Cleanup Goal Extending beyond the Old Town Phase I Boundary

Site soil data illustrated in Figure A-2 in Appendix A show that PCBs are present at concentrations greater than the cleanup goal in at least two locations beyond the Old Town Phase I boundary and cleanup area within it, which is subject to this plan (see Section 1.3 above): in the area north of the Building 52A slab and in the roadway to the west of Building 52. Removal of the contaminated soil at these locations is addressed in Section 4.2. The cleanup at these locations may be conducted during Phase I of the Old Town Demolition Project or at a future date.

It is possible that sampling triggered by unanticipated conditions encountered during demolition or verification sampling will indicate that PCBs at concentrations greater than the cleanup goal extend beyond the project boundary in locations other than those identified in this cleanup plan. LBNL will work with EPA to decide on a course of action regarding cleanup of such locations. Depending on factors such as the nature and extent of such contamination, availability of funding, and schedule considerations, the current cleanup scope may be expanded to include cleanup of these areas, or the cleanup may be conducted as a future phase or a separate project. Procedures described below would be implemented to ensure that such residual contamination can be reliably located and addressed in the future.

4.10.1 Boundary Survey

If residual PCBs at concentrations greater than the cleanup goal beyond the project boundary are not addressed during Phase I, the impacted area outside the project boundary, to the extent known, will be surveyed by a California-licensed land surveyor using the UC grid system prior to backfilling. The boundary survey results will be included in the cleanup completion report.

4.10.2 Physical Barriers

If clean fill is placed in a cleaned up area adjacent to a contaminated area that lies beyond the project boundary, the contaminated soil will be separated from the clean backfill using a permeable geotextile (Tencate Mirafi N-Series nonwoven polypropylene geotextile or similar). The location and specifications of the permeable geotextile will be documented in the cleanup completion report.

5 WASTE MANAGEMENT

PCB-containing waste generated during demolition of the building slabs and soil cleanup at the Site will be segregated from non-PCB wastes and disposed of in conformance with the requirements of TSCA and the California Hazardous Waste Control Law codified in Division 4.5 of Title 22 of the California Code of Regulations (CCR). Four general categories of PCB remediation waste defined in Section 761.61(a)(4) may be generated during the cleanup: 1) bulk PCB remediation waste, including sediment, and soil; 2) materials with non-porous surfaces, such as steel pipes; 3) materials with porous surfaces, such as concrete, wood, and clay; and 4) liquids. Characterization and disposal requirements for these wastes are discussed below.

5.1 Waste Characterization

Sample data collected prior to demolition of the building slabs and soil cleanup (see Section 2) to represent "as found" site conditions will be used to characterize PCB remediation waste for off-site disposal. This waste includes concrete, soil, and other bulk debris. Any such waste that has not been pre-characterized and is encountered during demolition will be characterized *in situ*, as discussed in Sections 4.4 through 4.6; in accordance with the field sampling methods specified in Section 7 and analytical procedures specified in Section 9. Bulk samples will be collected and analyzed for PCBs from any potentially PCB-impacted porous materials. Wipe samples will be collected from any potentially PCB-impacted non-porous materials discovered.

PCB-containing liquid waste generated during demolition and cleanup will include decontamination solvents, decontamination water, and/or other fluids that may have come into contact with PCBs in concrete, soil, pipes, or other materials. These fluids will be characterized in accordance with field methods described in Section 7 and analytical procedures specified in Section 9 for liquid samples.

Storm water and groundwater that accumulates in open excavations and decontamination water will be treated as described in Section 8.3.2.3 and, consistent with Sections 761.50 and 761.79(b)(1)(ii), discharged to the sanitary sewer in conformance with a special discharge permit obtained from EBMUD (see Appendix G for permit). Prior to discharge, the treated water will be analyzed for PCB congeners by by EPA Method 1668 and for other contaminants specified in the permit, and will only be discharged if the permit limit of 0.017 µg/L for the sum of the 59 PCB congeners listed in the permit can be met. LBNL's contractor must obtain written permission from LBNL's Environmental Services Group for treatment and discharge of decontamination water.

Samples of residues (sediments and sludge) and filters removed from components of the treatment system used to clean water accumulated in excavations will be collected and analyzed for contaminants of potential concern, including PCBs, to characterize these residues and filters for disposal in compliance with Section 761.79(g).

5.1.1 PCB Remediation Waste

Per Section 761.3, waste containing total PCBs as a result of a spill, release, or other unauthorized disposal at the following concentrations is defined as PCB remediation waste:

- equal to or greater than 50 parts per million (ppm), regardless of the concentration of the original spill (for materials disposed of prior to April 18, 1978)

- any concentration where the original source was equal to or greater than 500 ppm PCBs beginning on April 18, 1978, or equal to or greater than 50 ppm PCBs beginning on July 2, 1979
- any concentration, if the PCBs are spilled or released from a source not authorized for use

LBNL cannot establish the initial source concentrations or the dates of releases of PCBs to concrete and soil, hence soil, concrete, and other associated waste with detected PCBs will be characterized as PCB remediation waste.

Residues (sediments and sludge) and filters removed from components of the treatment system used to clean water accumulated in excavations will also be characterized as PCB remediation waste in compliance with Section 761.79(g).

5.1.2 PCB Radioactive Waste

In addition to sampling for PCBs, concrete, soil, liquids, and other wastes that may be radiologically contaminated will be characterized to identify radioisotopes and gross radioactivity. Any PCB remediation waste that is characterized as low-level radioactive waste will be managed as a PCB radioactive waste per Section 761.60(b)(7). Disposal of the waste will take into account both its PCB concentration and its radioactive properties. If – taking into account only the properties of the PCBs in the waste (and not the radioactive properties of the waste) – the waste meets the requirements for disposal in a facility permitted, licensed, or registered by a State as a municipal or non-municipal non-hazardous waste landfill, it may be disposed of without regard to the PCB component of the waste, on the basis of its radioactive properties, in accordance with all applicable requirements for the radioactive component of the waste.

5.1.3 Liquid PCB Remediation Waste

Any liquid waste not discharged under permit from EBMUD to the sanitary sewer, including rinse solvents, will be characterized as liquid PCB remediation waste for disposal in compliance with Sections 761.79(g) and 761.60(a).

5.1.4 PCB Cleanup Waste

Non-liquid cleaning materials and personal protective equipment waste, and other materials such as rags, gloves, booties, and similar materials containing PCBs from cleanup of soil, concrete, sediments or other materials containing PCBs at any concentration will be managed as PCB cleanup waste in accordance with Section 761.61(a)(5)(v) and disposed of at a municipal landfill as specified in Table 4.

5.1.5 Hazardous Waste Pursuant to California Hazardous Waste Control Law

In addition to compliance with TSCA for characterization, storage, transportation and disposal, waste containing PCBs is considered a hazardous toxic waste regulated by the State of California if the total PCB concentrations are at or greater than the following threshold concentrations:

- for wastes containing 100 percent solid material (*i.e.,* no free liquids): the total threshold limit concentration (TTLC) of 50 mg/kg of total PCBs;
- for sludges, slurries, tar-like, resinous, multiphasic, and liquid wastes: the soluble threshold limit concentration (STLC) of 5 milligrams per liter (mg/L) of total PCBs detected in an extract obtained using the waste extraction test per Title 22.

Concrete, soil, sediment, and other solid waste containing total PCBs at concentrations of 50 mg/kg or greater will be designated as non-RCRA hazardous waste per Title 22 CCR Section 66261.24 in addition to designations required by TSCA. Non-solid waste with PCBs at concentration of 5 mg/L or greater will also be designated as a non-RCRA hazardous waste per Title 22, Section 66261.24.

5.2 Waste Designations, Disposal Requirements, and Designated Disposal Facilities

The characterization data will be used to determine the appropriate waste designations and disposal requirements. A summary of anticipated waste designations, treatment and disposal facility requirements, as well as the designated disposal facilities is provided in Table 4. If other facilities are selected, LBNL will verity that these facilities have the appropriate permits and meet the TSCA requirements listed in Table 4.

LBNL intends to dispose of PCB radioactive waste at the Nevada National Security Site (NNSS). The NNSS is permitted to accept PCB remediation waste that is also a low-level radioactive waste. PCB waste that meets the requirements for disposal in a facility permitted, licensed, or registered by a State as a municipal or non-municipal non-hazardous waste landfill, may be disposed of at the non-RCRA cell at NNSS. PCB remediation waste that must be disposed of at a hazardous waste landfill permitted by EPA under Section 3004 of RCRA, or by a State authorized under Section 3006 of RCRA will be disposed of in the RCRA cell at NNSS. PCB waste that requires disposal at a facility approved under TSCA, an incinerator compliant with Section 761.70, or a high efficiency boiler in compliance with Section 761.71(a) or (b) cannot be disposed of at NNSS. Similarly, radioactive liquid PCB remediation waste must be disposed of per Section 761.61(b) and NNSS cannot accept such waste. If any PCB radioactive waste that cannot be disposed of at NNSS were to be generated, a facility that complies with the TSCA and DOE disposal requirements will be selected.

Table 4. PCB Waste Designations and Disposal Requirements Pursuant to TSCA and California Hazardous Waste Regulations

Waste	PCB Concentration Regulated per 40 CFR 761	Waste Designation per40 CFR 761	PCB Concentration Regulated per Other Regulations	Additional Waste Designation	Treatment and/or Disposal Facility Requirements per TSCA[1]	Designated Treatment and/or Disposal Facility[2]
Concrete, soil or other porous material contaminated from spill or leak	<50 mg/kg	Bulk PCB Remediation Waste §761.61(a)(4)(i)	<50 mg/kg TTLC < 5 mg/L (STLC) (Title 22 CCR)	–	A facility permitted, licensed, or registered by a State to manage municipal waste. §761.61(a)(5)(v)(A)(1)	Altamont Landfill
	≥50 mg/kg		≥50 mg/kg TTLC ≥5 mg/L (STLC) (Title 22 CCR §66261.24)	California Non-RCRA Hazardous Waste	Hazardous waste landfill permitted by EPA under section 3004 of RCRA, or by a State authorized under section 3006 of RCRA, or a PCB disposal facility approved under TSCA. §761.61(a)(5)(i)(B)(2)(iii)	Kettleman Hills[3]
Pipes or other non-porous materials	< 100 µg/100 cm^2	PCB Remediation Waste §761.61(a)(5) (ii)	<50 mg/kg TTLC < 5 mg/L (STLC) (Title 22 CCR §66261.24)	–	A facility permitted, licensed, or registered by a State to manage municipal waste. §761.61(a)(5)(v)(A)(1)	Altamont Landfill
	≥ 100 µg/100 cm^2			–	Hazardous waste landfill permitted by EPA under section 3004 of RCRA, or by a State authorized under section 3006 of RCRA, or a PCB disposal facility approved under TSCA. §761.61(a)(i)(B)(2)(iii)	Kettleman Hills[3]
Treatment tank residues and filter media	<50 mg/kg	PCB Remediation Waste 761.79(g)(1)	<50 mg/kg TTLC < 5 mg/L (STLC) (Title 22 CCR §66261.24)	–	A facility permitted, licensed, or registered by a State to manage municipal waste. §761.61(a)(5)(v)(A)(1)	Altamont Landfill
	≥50 mg/kg		≥50 mg/kg (TTLC) ≥5 mg/L (STLC) (Title 22 CCR §66261.24)	California Non-RCRA Hazardous Waste	Hazardous waste landfill permitted by EPA under section 3004 of RCRA, or by a State authorized under section 3006 of RCRA, or a PCB disposal facility approved under TSCA. §761.61(a)(i)(B)(2)(iii)	Kettleman Hills[3]

Waste	PCB Concentration Regulated per 40 CFR 761	Waste Designation per40 CFR 761	PCB Concentration Regulated per Other Regulations	Additional Waste Designation	Treatment and/or Disposal Facility Requirements per TSCA[1]	Designated Treatment and/or Disposal Facility[2]
Non-liquid cleaning materials and personal protective equipment waste, including non-porous surfaces and other materials such as rags, gloves, booties other disposable personal protective equipment, and similar materials resulting from cleanup activities	Any concentration	Cleanup waste 761.61(v)(A)	<50 mg/kg (TTLC) <5 mg/L (STLC)	California designated waste[4]	A facility permitted, licensed, or registered by a State to manage municipal waste. §761.61(a)(5)(v)(A)(1)	Altamont Landfill
			≥50 mg/kg (TTLC) ≥5 mg/L (STLC) (Title 22 CCR §66261.24)	California Non-RCRA Hazardous Waste	Hazardous waste landfill permitted by EPA under section 3004 of RCRA, or by a State authorized under section 3006 of RCRA	Kettleman Hills[3]
Water containing PCBs[5]	<0.5 µg/L	Non-PCB	0.017 ppb for sum of specific PCB congeners (see Appendix G, for EBMUD permit per Section 307(b) of CWA)	Special Discharge	Unrestricted use §761.79(b)(1)((iii) Water <0.5 µg/L PCBs may not be discharged to tributaries to SF Bay due to impairment from PCBs.	Sanitary sewer per EBMUD Special Discharge Permit
	<3 ug/L or discharge limit in permit per Clean Water Act (CWA)			Special Discharge	May be discharged to a treatment works or to navigable waters §761.79(b)(1)(ii)	Sanitary sewer per EBMUD Special Discharge Permit
	≥ 50 mg/L	PCB Liquid Waste	≥ 5 mg/L (Title 22 CCR §66261.24)	California Non-RCRA Hazardous Waste	Hazardous waste landfill permitted by EPA under section 3004 of RCRA, or by a State authorized under section 3006 of RCRA, or a PCB disposal facility approved under TSCA.	TBD

Waste	PCB Concentration Regulated per 40 CFR 761	Waste Designation per40 CFR 761	PCB Concentration Regulated per Other Regulations	Additional Waste Designation	Treatment and/or Disposal Facility Requirements per TSCA[1]	Designated Treatment and/or Disposal Facility[2]
Liquids and decontamination solvents[5]	< 50 mg/L hydrocarbon decontamination solvents	PCB Liquids §761.60(a)	>5 mg/L (Title 22 CCR §66261.24)	California Non-RCRA Hazardous Waste	Incinerator compliant with §761.70. §761.79(g)(3) and § 761.60(a)	TBD
	≥50 mg/L < 500 mg/L				High efficiency boiler in compliance with 40 CFR §761.71(a) or (b), or incinerator compliant with §761.70. §761.60(a) Treatment is required prior to land disposal per Title 22 §66268.32(a)	TBD
	≥ 500 ppm				Incinerator operating in compliance with 40 CFR §761.70 §761.60(a)	TBD
Any of the above non-liquid wastes that are also considered low-level radioactive waste	<50 mg/kg	PCB/radioactive waste if regulated for PCB content; (otherwise LLRW)	<50 mg/kg TTLC < 5 mg/L (STLC) (Title 22 CCR §66261.24)	Low-level Radioactive Waste	Low-level waste disposal facility that is authorized to receive PCB remediation waste with PCB <50 mg/kg.	NNSS[6]
Any of the above non-liquid wastes that are also considered low-level radioactive waste	≥50 mg/kg		>50 mg/kg TTLC > 5 mg/L (STLC) (Title 22 CCR §66261.24)	California Non-RCRA Hazardous Waste Low-level Radioactive Waste	Low-level waste disposal facility that is authorized to receive non-liquid PCB remediation waste with PCB ≥50 mg/kg	NNSS[6]

1. The least restrictive facility is listed. Disposal at more restrictive facilities is allowed.
2. Another facility besides the designated facility may be selected as long as it meets the requirements listed.
3. PCB disposal facility approved under TSCA and permitted to accept non-RCRA hazardous waste
4. Designated waste, as defined in California Water Code section 13173, shall be discharged only at Class I waste management units or at Class II waste management units approved by the RWQCB for containment of the particular kind of waste to be discharged.
5. If a multi-phasic mixture (*i.e.*, immiscible fluids or both non-liquid and liquid media), you may separate and analyze each phase, otherwise manage the waste for TSCA compliance for the phase with the highest PCB concentration, unless otherwise specified.

6. If taking into account the PCB component of the PCB radioactive waste, the PCB component meets the requirements for disposal in a facility permitted, licensed, or registered by a State as a municipal or non-municipal non-hazardous waste landfill, may be disposed of at the non-RCRA cell at NNSS. PCB radioactive waste, the PCB component of which must be disposed of at a hazardous waste landfill permitted by EPA under section 3004 of RCRA, or by a State authorized under section 3006 of RCRA will be disposed of in the RCRA cell at NNSS. PCB radioactive waste, of which the PCB component requires disposal at a facility approved under TSCA, an incinerator compliant with §761.70, or a high efficiency boiler in compliance with 40 CFR §761.71(a) or (b) cannot be disposed of at NNSS. PCB radioactive waste generated per Section 761.61(b) cannot be disposed of at NNSS.

5.3 Waste Storage

PCB remediation wastes, such as concrete or soil, will be loaded directly onto trucks outfitted with liners and waterproof covers or into storage or shipping containers compatible with the waste and in good condition. Containers will be transferred to an accumulation area described in Section 5.3.2 below.

5.3.1 Containers

Except for containers used for storage of PCB radioactive waste or containers meeting the requirements specified in Section 761.65(c)(6)(ii), containers used for the storage of liquid or non-liquid PCB waste will be in accordance with the requirements set forth in the DOT Hazardous Materials Regulations (HMR) at 49 CFR Parts 171 through 180. PCB waste not subject to the HMR (*i.e.*, PCB wastes at concentrations of <20 ppm or <1 pound of PCBs, regardless of concentration) will be packaged in accordance with Packaging Group III, unless other hazards associated with the PCB waste cause it to require packaging in accordance with Packaging Groups I or II.

Liquid PCB wastes will be stored in containers, including 55-gallon drums or totes that meet the specifications of 49 CFR, Parts 171 through 180. Storm water and decontamination water, which may contain trace amounts of PCBs, will be pumped directly into 21,000-gallon metal water storage tanks and treated in accordance with a special discharge permit issued by EBMUD (included in Appendix G). Decontamination water – if not pumped directly to the 21,000-gallon tank – may be placed temporarily in totes and subsequently pumped to the 21,000-gallon tanks.

Each PCB waste container will be marked with:

- the out-of-service date (accumulation start date – the date when waste is first placed in the container – for purpose of compliance with hazardous waste regulations)
- a PCB mark (M_L)

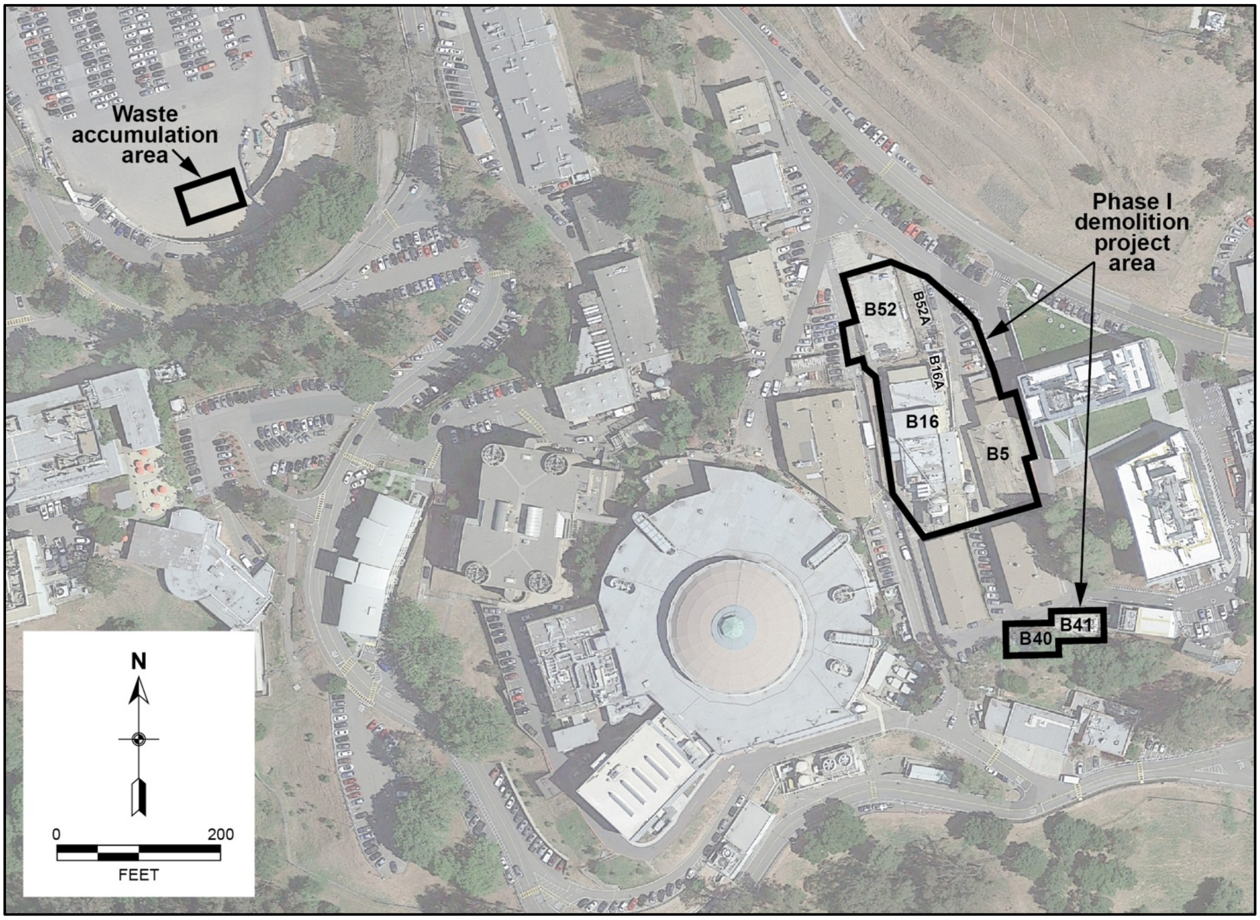
When the PCB waste is also a hazardous waste the following labeling is required:

- a hazardous waste label that specifies the following:
    - composition (*e.g.*, soil, concrete, personal protective equipment [PPE]) and contaminants
    - physical state of the waste (*e.g.,* liquid, solid)
    - hazardous properties of the waste (*e.g.*, flammable, toxic)
    - name and address of the person producing the waste

5.3.2 Waste Accumulation Area

PCB waste that is not directly loaded onto trucks and transported for disposal will be moved from the point of generation to a waste accumulation area (WAA) designated for storage of waste from the project per Section 761.61(a)(1). The location of the WAA is shown in Figure 16. Containers of PCB waste will be held in the WAA pending shipment off-site.

Figure 16. Waste Accumulation Area in which PCB Waste will be Temporarily Stored



The WAA is fenced and access is restricted to assigned personnel trained in waste management requirements. Warning signs prohibiting unauthorized access are posted, in addition to signage required for hazardous and low-level radioactive waste. The PCB M_L mark will be posted on the entrances to the WAA when PCB wastes are placed in the area per Section 761.65(c)(3).

PCB waste will be stored in the WAA in containers described in Section 5.3.1. Containers stored in the WAA will be covered (*e.g.*, with a tarp) or placed inside a container (*e.g.*, intermodal), or otherwise managed to protect them from the elements and prevent releases to the environment and meet the intent of Section 761.65(b)(1)(i).

Containers with liquids containing PCBs at concentrations greater than or equal to 50 mg/L will be stored in secondary containment with capacity at least two times the internal volume of the largest PCB container, or 25 percent of the total internal volume of all PCB containers stored in the WAA, whichever is greater. The containers will be stored under cover or covered to prevent contact with rain water The containment and cover provide protection equivalent to that required per Section 761.65(b)(1)(ii).

PCB radioactive wastes will be stored in packaging and in a manner approved for low-level radioactive waste storage in conformance with Section 761.65(c)(6)(i) (*i.e.*, non-leaking, designed to prevent buildup of liquids, meet all requirements pertaining to nuclear criticality safety, be constructed of polyethylene or stainless steel and compatible with the wastes stored).

Per Section 761.65(c)(8), storage in the WAA will be managed so that the PCB containers can be located by the out-of-service date.

The floor of the WAA is constructed of concrete, which prevents or minimizes the penetration of PCBs. There are no drains within the WAA footprint. In addition, the WAA is located above the 100-year flood water elevation. Storm water controls are implemented in and around the WAA, including storm drain inlet protection of storm drains outside of the WAA, sweeping, wattles for run-on prevention, and other BMPs, as appropriate, (see Section 8.3.2) to prevent releases of PCBs from the WAA, providing protection effectively similar to that required per Section 761.65(b)(1)(iii).

The WAA is equipped with emergency equipment, including spill control materials, spill cleanup supplies, and PPE appropriate for the waste stored, along with a fire extinguisher, emergency eyewash and shower. Any PCB spills will be cleaned up in accordance with subpart G of Part 761. A written contingency plan is also in place for compliance with RCRA and 22 CCR 66265.52 for cleanup of spills of hazardous waste.

All regulated waste containers held in the WAA, including PCB waste, will be inspected weekly, surpassing the 30-day inspection requirement of Section 761.65(c)(1). The inspections will be documented and corrective actions will be tracked to resolution. Containers found to be in poor condition (*e.g.*, rusting) or leaking will be over-packed into a properly marked non-leaking container per Section 761.61(c)(5); or the wastes will be transferred to another container and any spill immediately cleaned up following the requirements of Subpart G of Part 761. Compliance with storage time limits will also be verified during the inspections. Although not anticipated, if 45 kilograms of PCBs were to be stored in the WAA at any one time, records required per Section 761.180(a) will be maintained at LBNL.

Hazardous waste may be held in the WAA for a maximum of 90 days, in compliance with federal and state regulations applicable to large quantity generators of hazardous waste (40 CFR 262.34 and 22 CCR 66262.34) and in compliance with requirements for storage of low-level radioactive waste, all of which require that measures be in place for protection of human health and the environment in case of hazardous material releases. For consistency with these permitted storage durations and to allow for waste consolidation and flexibility in scheduling of shipments to an off-site treatment or disposal facility in as few shipments as practicable, storage of non-liquid PCB remediation wastes in containers for up to 90 days in the WAA is requested herein. If approved, the 30-day temporary storage allowed per Section 761.65(c)(1) for appropriately packaged non-liquid PCB waste would be increased by 60 days (for a total of 90 days).

Per Section 761.65((b)(2)(vi) storage of PCB that does not conform to all requirements of Section 761.65(b) may be approved per Section 761.61(c) or 761.62(c). Per Section 761.61(c) "any person wishing to […] store PCB remediation waste in a manner other than prescribed in Section 761.65 must provide "information indicating that, based on technical, environmental, or waste-specific characteristics or considerations, the proposed […] storage methods or locations will not pose an unreasonable risk of injury to health or the environment." As described above, storage of non-liquid PCB remediation in the WAA will not pose an unreasonable risk of injury to health or the environment.

All movable equipment used for handling PCBs and PCB items in the WAA that has come in direct contact with PCBs will be decontaminated as specified in Section 4.6 as required per Section 761.79(c)(2).

5.3.3 Waste Acceptance Criteria

LBNL's contractor, DMS, will provide to the disposal facility waste characterization documentation, including analytical data showing the *in situ* concentrations of the PCB remediation waste collected as described in Section 4.9 above. DMS shall obtain confirmation that all waste proposed to be shipped to the disposal facility meets the waste acceptance criteria of the facility and can be accepted in compliance with the facility's permit. A method of communication (email, telephone) regarding the receipt of the waste will be arranged with the disposal facility.

5.3.4 Waste Packaging

PCB waste will be packaged in accordance with DOT specifications in 49 CFR, Parts 171 through 180, as applicable. Waste with total PCB concentration less than 20 ppm or containing less than one pound of PCBs does not meet the DOT's definition of a hazardous material and may be packaged in accordance with Packaging Group III requirements, unless other hazards associated with the PCB waste cause it to require packaging in accordance with Packaging Groups I or II.

Each container with 50 mg/kg or greater of PCBs (per the designation discussed in 5.1.4 above) and each PCB item will be marked with an M_L label specified in Section 761.4, and a hazardous waste label.

5.3.5 Waste Manifests

Waste streams with total PCB concentrations equal to or greater than 50 mg/kg must be shipped under a uniform hazardous waste manifest (EPA Form 8700-22) per 761 Subpart K and Title 22 CCR. Non-liquid waste streams with PCB concentrations of less than 50 mg/kg and non-liquid cleanup waste under Section 761.61(a)(5)(v) will not require a hazardous waste manifest.

The following shipping descriptions will be used for PCB waste subject to DOT regulations and transported by highway or rail, unless characteristics of the waste require another shipping description:

- "UN2315, polychlorinated biphenyls, liquid, 9, Packing Group (PG) III" or
- "UN3432, polychlorinated biphenyls, solid, 9, PG III"

Shipments of reportable quantities of PCBs (one pound by weight of PCB in a single container) will be described by one of the following:

- "UN2315, RQ, Polychlorinated biphenyls liquid, 9, PG II" or
- "UN3432, RQ, Polychlorinated biphenyls, solid, 9, PG II"

Waste not subject to requirements of the DOT Hazardous Materials Regulations (less than 20 ppm PCBs or less than one pound) will be described on the manifest as ''Non-DOT Regulated PCBs."

If the waste is designated as a California hazardous waste, the following waste code will be used to describe the waste, as appropriate:

- 261, Polychlorinated biphenyls and material containing PCBs; or
- 731, Liquids with polychlorinated biphenyls greater than 50 mg/L

The following information will be specified on each manifest:

- For each bulk load of PCBs, the identity of the PCB waste, the earliest date of removal from service for disposal, and the weight in kilograms of the PCB waste.

- For each PCB Article Container or PCB Container, the unique identifying number, type of PCB waste (*e.g.*, soil, debris, small capacitors), earliest date of removal from service for disposal, and weight in kilograms of the PCB waste contained.
- For each PCB Article not in a PCB Container or PCB Article Container, the serial number if available, or other identification if there is no serial number, the date of removal from service for disposal, and weight in kilograms of the PCB waste in each PCB Article.

For PCB waste that is designated as a California hazardous waste, one copy of the manifest will be mailed to: DTSC Generator Manifests, P.O. Box 400, Sacramento, California 95812-0400.

5.4 Transportation for Off-Site Disposal

PCB waste will be shipped in packaging conforming to the requirements of the DOT and the receiving facility.

Bulk PCB remediation waste will be loaded directly onto trucks or bins equipped with liners, properly contained and covered to prevent exposure to precipitation and wind dispersion. If there is a delay in shipment, the loaded transport vehicle will be staged in the WAA until it can be shipped.

All loads will be marked, labeled, and placarded as required by the DOT. For any liquid PCB wastes, each transport vehicle loaded with PCB containers that contain more than 99.4 pounds of liquid PCB at concentrations greater than or equal to 50 ppm will be marked on each end and each side with the M_L mark as described in Section 761.45(a).

Waste containers and unloaded, as well as loaded, transport vehicles will be weighed to ensure manifests and shipping papers accurately reflect the weight of the loaded wastes (within 10 percent).

5.4.1 Notification of PCB Activity pursuant to Toxic Substances Control Act

For transport of waste with PCB concentrations equal to or greater than 50 mg/kg, DMS will only utilize a transporter that has submitted to EPA Headquarters a "Notification of PCB Activity" using EPA Form 7710-53, per Section 761.205 and who is registered with the California DTSC as hazardous waste transporter.

5.5 Confirmation of Waste Receipt and Certificate of Disposal

Following the shipment of waste to the designated facility, a confirmation by telephone, email, or as otherwise agreed upon with the facility, will be made that the facility actually received the waste. This confirmation will be made by the close of business the day after receipt of the signed manifest from the storage or disposal facility.

If the hand-signed uniform hazardous waste manifest has not been received within 35 days after the transporter accepted the PCB waste, DMS or LBNL shall contact the receiving facility to determine whether the PCB waste has actually been received. If the PCB waste has not been received, DMS or LBNL will contact the transporter to determine the disposition of the PCB waste. If LBNL has not received a hand-signed manifest from the designated facility within 10 days from the date of the contact with the transporter, DMS will prepare – and LBNL will submit – an exception report to the EPA Regional Administrator for Region 9 and the DTSC.

Pursuant to Section 761.218, disposal facilities will be required to provide a certificate of disposal for each PCB waste identified on a uniform hazardous waste manifest. The disposal facility must send the certificate within 30 days of the actual disposal date. Per Section 761.218, LBNL will retain a copy of the certificate for 3 years.

LBNL will notify EPA if LBNL has not received a certificate of disposal within 13 months from the date of removal from service for disposal, or the certificate shows the PCBs were disposed of more than one year after the date they were removed from service.

6 CLEANUP VERIFICATION SAMPLING

Verification sampling will be conducted after the slabs, utilities, and soils are removed from the Site per the excavation design described in Section 4.2. All verification soil samples will be collected, managed, and analyzed according to the procedures discussed in Section 9.1.

6.1 Sample Design Parameters

The verification sampling will be conducted in a manner designed to avoid decision errors resulting in residual PCBs remaining in the soil at the Site at concentrations that may impact human health or the environment. To avoid such errors, a statistical testing process will be used to develop the basis for the sampling grid used to verify that the soil cleanup goal (0.94 mg/kg) has been effectively achieved.

The statistical hypotheses are:

> H_o: the true mean total PCB concentration in residual soil is greater than 0.94 mg/kg
>
> H_a: the true mean total PCB concentration in residual soil is at or less than 0.94 mg/kg

Unless there is conclusive information from the verification sampling data to reject the null hypothesis (*i.e.*, H_o, the baseline condition) for the alternative hypothesis (*i.e.,* H_a, achievement of the cleanup goal), it will be assumed that the baseline condition is true.

The primary consequence of making a false rejection (type I) error by incorrectly rejecting a true null hypothesis is that soil containing PCBs at concentrations greater than the cleanup goal would be left on site, possibly endangering human health and the environment.

The primary consequence of making a false acceptance (type II) error by failing to reject a false null hypothesis is considerable expense to LBNL associated with remobilization to remove and dispose of soil containing PCBs at concentrations less than the cleanup goal.

Accordingly, due to the higher consequence of possibly endangering human health and the environment by potentially rejecting H_o when residual contamination is present at concentrations greater than the cleanup goal, a false rejection error tolerance is set to be no higher than 10 percent and a false acceptance decision error tolerance is set to be no higher than 20 percent. The extent of the grey region will be set at 0.2 mg/kg. In this case, acceptance of the grey region indicates that LBNL is willing to accept a higher probability of cleaning up soil between 0.74 and 0.94 mg/kg given that it will require fewer confirmation samples than if a narrower grey region (*e.g.*, 0.1 mg/kg) were selected.

6.2 Sampling Design

Verification sampling will be conducted using a square grid system. Composite or incremental sampling techniques will not be employed. A sampling grid will be applied to the areas of completed excavation – defined here as decision units – to verify that cleanup goals have been achieved. The grid spacing was developed with the Visual Sample Plan (VSP) software (VSP Development Team, 2016) using the decision error parameters defined in Section 6.1 and a site-specific standard-deviation estimate for PCB concentrations of 0.55 mg/kg for soil underlying the planned area of excavation (Figure A-4 and Appendix F). Based on these parameters, the minimum number of samples required to determine cleanup completion at Buildings 52 and 52A and the electrical pad is 56. Based on the geometries of the excavation footprints and the location of the random-start grid, a grid spacing of 7.5 feet is estimated to yield at least this number of samples. The technical basis for this determination, along with an example sampling grid, is provided in Appendix F.

In addition to the randomly determined sample locations, six samples will be collected from pre-determined locations in the two areas in the vicinity of samples SB52-14-2 and SB52-14-43 (Appendix A, Figure A-2) where PCB concentrations exceed 50 mg/kg in deeper soil. In these areas, the excavations will be at least six feet deep. In the deep excavation near SB52-14-2, one sample will be collected from the bottom of the excavation, and one sample will be collected from each of the four side walls. The side-wall samples will be collected at a depth of 6 feet below the original grade, which is approximately the mid-depth of the highest zone of PCB concentrations in this area (4 to 8 feet). In the deep excavation near SB52-14-43, one sample will be collected from the bottom of the excavation.

If the excavation and backfilling of the Site are conducted in phases, the sampling grid may be applied independently to multiple areas (decision units) at different stages to facilitate efficient sequencing of the demolition. If verification sampling follows such a sequenced approach to facilitate demolition, the sample spacing will remain fixed at 7.5 feet, such that the total number of samples required for the entire excavation area (*i.e.*, the aggregate area of the decision units) will be at least 56 samples. The grids shall be applied using a random start position established for each decision unit and oriented with one grid axis aligned with magnetic north, when appropriate.

The grid will be laid out in the field, sample points physically marked, and sample locations and elevations surveyed as described in Section 7.10.

6.3 Cleanup and Backfill Decision Parameters

Verification sample results will be analyzed spatially and used to calculate the 95 percent upper confidence limit on the mean (95 UCL) for direct comparison to the cleanup goal. It is expected that ten or more valid data points will be required to develop the 95 UCL, but specific statistical testing will need to be performed for each data set to confirm the number of samples required for the calculation. Single point sample results within a decision unit (defined in Section 6.2) may exceed the cleanup goal, but additional cleanup would only be required if the 95 UCL concentration is determined to be greater than the cleanup goal or if the spatial analysis of the results shows that adjacent sample results exceed the cleanup goal. If adjacent samples exceed the cleanup goal, LBNL will prepare a map showing the spatial distribution of the verification sample results and the need for additional excavation will be determined jointly by LBNL, DOE, and EPA. The decision, including the basis for the decision, will be documented in an email or letter prepared by EPA and provided to LBNL within 5 working days of the joint decision.

Once the cleanup goal has been met for a decision unit, to begin backfilling, approval will also be obtained from EPA. EPA will approve backfilling within 5 working days of the decision that the cleanup goal has been achieved. All emails and letters documenting EPA's decisions will be included in the cleanup completion report (see Section 12).

When the number of valid samples in a decision unit is less than is required to calculate the 95 UCL, all sample results must be at or less than the cleanup goal for the cleanup goal to be met for the decision unit. Any decision unit for which LBNL confirms all sample results are at or less than the cleanup goal may be backfilled. If the cleanup goal is not met, additional excavation and sampling may be performed. Cleanup verification under these circumstances will be based on a re-evaluation of the entire decision unit based on the process described above. If additional excavation is not possible, the excavation boundaries and areas of known residual PCB concentrations greater than the cleanup goal will be surveyed by a

California licensed land surveyor using the UC grid system prior to backfilling. The location(s) of known residual contamination, if any, will be documented in the cleanup completion report (see Section 12).

7 FIELD SAMPLING METHODS

Soil samples will be collected for verification of cleanup completion as described in Section 6. Verification samples will be collected in situ from the surface to a maximum depth of 3 inches. Soil and concrete samples may also be collected *in situ* for additional site characterization if determined necessary either during demolition or during collection of samples per the *Sampling and Analysis Plan PCB Data Gaps, Concrete and Soil Old Town Phase I Demolition 2015* (DMS, 2015a). Samples will be collected in accordance with the soil sampling protocol described in Section 7.1 below.

7.1 Soil Sampling

The following supplies will be required for soil sample collection:

- Pre-cleaned containers (4-ounce jar with Teflon-lined cap [wide-mouth jars are preferred])
- Sample identification labels (pre-printed preferred)
- Phosphate-free detergent
- Tap water
- Distilled or deionized water
- Hexane for decontamination; to be provided by the analytical laboratory in a squeeze bottle
- Chain-of-custody (COC) forms (see Figure 17 for an example)
- Disposable gloves; nitrile gloves are recommended; latex gloves must not be used due to possible phthalate contamination
- Safety glasses, hearing protection, and other personal protective equipment such as leather gloves, safety shoes, and hard hats, to be specified in the work package for each task and work location
- Paper towels
- Permanent marker, wax pencils, and pens
- Measuring tape
- Stakes for marking soil sample locations
- Sample packaging and shipping supplies, such as bubble wrap and packing material
- Bagged ice or “Blue Ice” and coolers
- Temperature blank
- Field log book
- Maps of areas being sampled
- Camera

Soil samples will be collected consistent with the *Compendium of ERT Soil Sampling and Surface Geophysics Procedures* (EPA, 1991) and the *Standard Operating Procedures, Soil Sampling* (Scientific Engineering Response and Analytical Services, 2001). Verification samples will be collected by manual sampling methods (*e.g.*, scoops, trowels, spoons, or hand auger) or directly from the excavator bucket.

Due to the lack of precision with respect to actual depth or location when collecting samples from the backhoe or excavator bucket, this method will not be used unless more precise methods are not possible for safety reasons. If it is necessary to collect samples from the backhoe or excavator bucket, field sampling technicians shall take measures to minimize uncertainties in sample location and depth.

Subsurface soil samples for additional site characterization may be collected using a direct-push method or a hand auger in addition to the methods described above.

Collection of soil samples will be performed as follows:

1. Preparation

Prepare for sample collection, as follows:

1.1. Organize the sampling supplies in a clean area in the vicinity of the sampling point.

1.2. Identify the area to be sampled.

1.3. Don safety glasses, disposable gloves, and other personal protective equipment required per the safety section of the work package depending on field location and conditions (*e.g.*, hard hat and safety boots).

1.4. If a thick, matted root zone is present at or near the surface, it should be removed before the sample is collected.

2. Sampling by Manual Methods

Stainless steel spoons or disposable trowels and/or scoops may be used for surface soil sampling to depths of approximately 6 inches below ground surface where conditions are generally soft and non-indurated and there is no problematic vegetative layer to penetrate.

To collect another sample, change gloves, decontaminate the sampling spoon, trowel, or scoop per the procedure described in Section 7.5, and collect the next sample.

3. Sampling from Excavator or Backhoe Bucket

When unsafe to collect a soil sample directly (deep excavation or unstable soil conditions), the soil sample may be collected using the excavator bucket, as follows:

3.1. Prior to sample collection, remove paint, grease and rust by brushing, wiping, or other method, and decontaminate the bucket per procedure in Section 7.5.

3.2. The teeth of the excavator bucket may be used to safely collect a sample from a fairly specific location that may otherwise be difficult or dangerous to access.

3.3. Fill the 4-ounce sample container with a minimum of 50 grams of soil.

3.4. To collect another sample, change gloves, decontaminate the bucket per the procedure described in Section 7.5 below, and repeat steps 3.2 through 3.3

4. Sampling with Hand Augers

Hand augers may be used to advance boreholes and collect soil samples in the shallow subsurface. Typically, a two- to four-inch stainless steel auger bucket with a cutting head is used.

4.1. Remove grease and rust by brushing, wiping, or other method and decontaminate the auger bucket per the procedure described in Section 7.5 prior to sample collection.

4.2. Advance auger bucket to required depth by simultaneously pushing and turning using an attached handle.

4.3. Remove the bucket used to advance the hole and attach a clean bucket. Place the clean auger bucket in the hole and fill with soil to make up the sample and remove.

4.4. Discard top inch of soil in the auger bucket.

4.5. Place a minimum of 50 grams of soil in a 4-ounce jar.

4.6. To collect another sample: change gloves, decontaminate the hand auger bucket per the procedure described in Section 7.5, and repeat steps 4.1 through 4.5 above.

5. Sampling Using the Direct Push Method

5.1. Using a decontaminated sampler with an acetate sleeve, push or drive the sampling rod to the desired soil interval and extract the sampling rod from the ground.

5.2. Extract the acetate sleeve from the sampler and cut the desired sample intervals using a decontaminated hacksaw or other cutting tool. The size of the sample will be sufficient to provide a minimum of 50 grams of soil (approximately two-inch length of acetate sleeve).

5.3. Place precut polyethylene liners and plastic caps on both ends of the sample interval.

5.4. To collect another sample: change gloves, decontaminate sampler per the procedure described in Section 7.5, and repeat steps 5.1 through 5.3 above.

6. Marking Sample Locations and Recording Sample Information

6.1. Mark the sample location with a stake with the sample ID number.

6.2. Note sample location on the figure of the Site.

6.3. Complete sampling records in the field logbook and fill out the COC form per Section 7.11.

7.2 Concrete Sampling

For concrete sample collection, the following equipment is required in addition to equipment listed in Section 7.1 above:

- Rotary impact hammer variable speed drill
- One-inch or other suitable (*e.g.* half-inch, three-quarter-inch) diameter carbide tip drill bits
- Brush and cloths to clean area
- One-quart Cubitainer with the top cut out to collect the powder sample or aluminum foil
- Cleaned glass container (3 ounce or 60 mL) with Teflon lined cap
- Dedicated vacuum cleaner with a disposable filter or a vacuum pump with a high-efficiency particulate air filter

Concrete samples will be collected consistent with the *Standard Operating Procedure for Sampling Porous Surfaces for PCBs* (EPA, 2011). An impact hammer drill or similar tool will be used to collect approximately 15 grams of concrete. Collection of concrete samples will be performed as follows:

1. Organize the sampling supplies in a clean area in the vicinity of the sampling point.

2. Wear disposable gloves, safety glasses, a respirator, and other required personal protective equipment dependent on the sampling location and specified in the work package (*e.g.*, hard hat and safety boots) while sampling.
3. Identify the area to be sampled. For easy identification, sample locations may be pre-marked using a marker or paint. (Note: the actual drilling point must not be marked.)
4. Using a decontaminated drill bit or similar tool, remove approximately 15 grams of concrete and place into a 4-ounce sample container. A half-inch deep hole generates about 10 grams (20 mL) of powder.
    a. Lock the carbide drill bit into the impact hammer drill and plug the drill into an appropriate power source (*e.g.*, extension cord equipped with a ground fault circuit interrupter).
    b. Remove any surface debris with a clean brush or cloth prior to drilling. Note in the sampling logbook.
    c. Begin drilling in the designated location. Apply steady even pressure.
    d. The drill will provide a finely ground powder that can be easily collected.
    e. Use a Cubitainer with the top cut off or aluminum foil to transfer the powder to the sample container.
    f. Samples should be collected at half-inch depth intervals. Thus, the initial surface sample should be collected from 0 to 0.5 inches. Multiple holes located closely adjacent to each other may be needed to generate sufficient sample volumes for PCB analysis.
5. Seal the container with the lid, label it, and place it in a resealable bag inside a cooler with ice per Section 7.12.
6. Mark the centroid of the sample location with paint and mark the location with a sample ID number.
7. To collect another sample, change gloves, decontaminate drill bit per Section 7.5 and repeat steps 3 through 6, above.
8. Complete sampling records in the field logbook and fill out the COC form per Section 7.11.

7.3 Liquid Sampling

Liquids that require sampling, including storm water and other liquids in pipes, pits, and vaults may be encountered. Liquids will be sampled in accordance with the requirements of Section 761.1 and any other applicable requirements of Part 761. In addition to equipment listed in Section 7.1 above, the following equipment is required:

- Pre-cleaned one-liter amber glass bottles
- Disposable bailer or other sampling equipment
- Stainless steel scoop and bucket

- Smaller pre-cleaned glass containers if necessary to scoop liquid samples into the sampling bottle

To collect the liquid samples, follow these steps:

1. Organize the sampling supplies in a clean area in the vicinity of the sampling point.
2. Wear disposable gloves, safety glasses and other personal protective equipment required per the work package while sampling.
3. Collect samples directly from the liquid source by pouring directly into the laboratory supplied one-liter amber glass jar. If necessary, a smaller container (such as a clean soil sampling jar) may be used to scoop the liquid into the amber jar.
4. If sampling from a pit or open vessel, use a disposable bailer or other sampling equipment to recover sufficient sample volume.
5. Transfer the liquid into the sample container, taking care not to spill the liquid.
6. Seal the container with the lid, label it, and place it in a resealable bag inside a cooler with ice.
7. Mark the location with a sample ID number if possible or identify the location in the field logbook.
8. To collect another sample, change gloves and repeat steps 1 through 7.
9. Complete sampling records in the field logbook and fill out the COC form per Section 7.11.

7.4 Wipe Samples

Wipe samples will be used to evaluate residual PCB contamination on equipment and on piping left-in-place. Wipe samples will be collected on the accessible interior surfaces of any piping suspected to contain PCBs. Wipe samples will be collected in accordance with Section 761.123 standard wipe sampling procedure (see Appendix E).

Wipe samples from pipes will be collected at a frequency of one sample for every 100 linear feet of pipe. The samples will be collected using a standard wipe sampling procedure as defined in Section 761.123. To allow comparison of the sample data to the threshold of 10 µg/100 cm^2, a surface sample from a minimum surface area of 100 cm^2 at each sampling location will be collected. To collect a sample from an area of 100 cm^2, the length of pipe listed in Table 5 will be wiped.

Small diameter pipes (less than 2 inches) will be cut at both ends to an appropriate length for purposes of sampling the pipe. If necessary, a stainless steel rod will be used to push the wipe through the length of the pipe specified in Table 5. If the wipe is too large to be pushed through a small diameter pipe, the wipe will be cut in half. Both sections of the wipe will be pushed through the pipe.

To avoid any potential loss of PCBs, pipes to be sampled will be cut using a saw. If a torch or other high temperature heat source is required to cut the pipes, the pipe will be sampled a minimum of 15 cm from the cut.

Table 5. Conversion Measurements for Pipeline Wipe Sampling

Inner Pipe Diameter (inches)	Inner Pipe Circumference (inches)	Length of Pipe to Sample (inches)	Area Sampled ($inches^2$)	Area Sampled ($centimeters^2$)
8	25.1	1	25.1	161.9
6	18.8	1.5	28.2	181.9
4	12.6	2	25.2	162.6
2	6.3	4	25.2	162.6
1	3.1	6	18.6	120.0
0.75	2.4	7	16.8	108.4

7.5 Decontamination of Sampling Equipment

All non-disposable equipment that comes into contact with potentially contaminated materials will be decontaminated in accordance with Section 761.79(c)(2). Decontamination will occur prior to each use of a piece of non-disposable equipment. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal. Records of decontamination will be kept as described in Section 14.2 to ensure compliance with Section 761.79(f). Decontamination wastes will be handled as described in Section 5.4.6.1 and in compliance with Section 761.79(g).

Lightly contaminated tools (*i.e.*, with no visible soil or debris adhered to the tool) may be decontaminated by swabbing surfaces with a paper towel moistened with hexane.

Heavily contaminated tools and equipment (with soil or debris adhered) will be decontaminated as follows:

1. Assemble three decontamination buckets.
2. The first bucket or containment contains a detergent and potable water solution, the second bucket is for water rinsate, the third is for hexane.
3. Scrape off adhered soil from the tools or equipment using brushes, shovels, or other tools.
4. Place all equipment and utensils in the detergent and water bucket or containment.
5. Scrub each piece thoroughly using the scrub brush to remove all soil.
6. Next, rinse each piece with water, followed by a rinse with hexane.
7. Place the rinsed pieces on clean paper towels or clean plastic sheeting for large equipment and individually dry and inspect each piece. Note: all pieces should be dry prior to reuse.

For decontamination of the excavator bucket used to collect samples the procedures in Section 4.8.2 will be used.

Transfer the water generated into a waste storage vessel designated for investigation derived liquid waste.

7.6 Investigation Derived Waste

Disposable equipment intended for one-time use and filters from vacuums used during sample collection will not be decontaminated, but will be placed in a double-lined plastic trash bag, along with used gloves and other disposable personal protective equipment for appropriate disposal following use. The bag will be dated and labeled with a completed "Pending Analysis" label and stored in a water-tight container at the Waste Accumulation Area. Wastewater from decontamination activities will be accumulated in a holding vessel, stored per Section 5.3, and analyzed for disposal.

Information obtained during sample collection that is relevant to waste characterization will be provided to LBNL's waste management personnel. Such information may include the composition and percentages of different constituents in the waste stream, physical state, and other characteristics. All waste will be characterized, managed, and transported off-site as described in Section 5. Disposal will be in conformance with Subpart D of Part 761 (Storage and Disposal).

7.7 Sample Containers, Preservation, and Holding Time

All sample containers provided by the analytical laboratory will be pre-cleaned by the manufacturer according to EPA requirements. Sample temperature requirements will include storage and transportation at or less than 6 degrees Celsius. Preservation requirements and holding times for PCB samples are listed in Table 6.

Table 6. Containers, Preservation, and Holding Time Requirements

Analytical Parameter	Matrix	Analytical Method Number	Sample Containers	Preservation Requirements	Holding Times
PCBs	Soil	EPA Method 8082A	4-ounce glass jar Teflon-lined cap or an acetate sleeve	Cool to ≤ 6^{o}Celsius	None
	Water		1 liter amber glass with Teflon-line cap	Cool to ≤ 6^{o}Celsius	None
PCB Congeners (for sewer discharge only)	Rain-water	EPA Method 1668 (only congeners per EBMUD permit)	1 liter amber glass with Teflon-line cap	Cool to ≤ 6^{o}Celsius	None

Notes:
Sample preparation and required analysis is discussed in Section 9.1 below.
EBMUD Permit is provided in Appendix G

Abbreviations:
EPA United States Environmental Protection Agency
PCB polychlorinated biphenyl

7.8 Documentation of Sample Collection and Shipment

7.8.1 Field Notes

Field documentation will include, at a minimum, entries in a field logbook, notes on sample location maps, and copies of filled-out COC forms (example in Figure 17).

A field logbook with consecutively numbered pages will be assigned to each sampler. All entries into the logbook will be recorded in indelible ink. At the end of each workday, the responsible sampler will cross out, sign, and date any unused portions of the logbook page last used. If it is necessary to transfer the logbook to another person, the person relinquishing the logbook will sign and date the last page used, and the person receiving the logbook will sign and date the next page to be used. At a minimum, the field logbook will contain the following information:

- Sample location, sample number, sample depth, and material type
- Required analysis
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as grab samples
- Type of sampling equipment used
- Field observations and details related to analysis or integrity of samples (*e.g.*, weather conditions, noticeable odors, and colors)

In addition to the sampling information, the following specific information will also be recorded in the field logbook for each day of sampling:

- Team members and their responsibilities
- Time of arrival on site and time of site departure
- Other personnel on-site
- Summary of meetings or discussions
- Deviations from this plan, site safety plans, and/or standard operating procedures
- Changes in personnel and responsibilities with reasons for the changes
- Levels of safety protection
- Calibration readings for any equipment used and equipment model and serial number

7.8.2 Photographs

Photographs will be taken at areas of interest and at all sample locations. They will serve to verify information entered in the field logbook. For each photograph taken, the following information will be written in the logbook:

- Time, date, location, and weather conditions
- Description of the subject photographed
- Name of person taking the photograph

7.9 Sample Numbering and Labeling

Samples will be uniquely designated with a sample identification number conforming to the requirements of *RP-006 Sample Collection Procedure, DMS-7209030-RIP-45 Rev. 0, April 2015* (DMS, 2015d). Relevant sample prefixes that will apply to samples collected per this cleanup plan:

- SC Concrete sample
- SD Soil

- SE Sediment
- LH Liquid sample

EXAMPLE OF SAMPLE IDENTIFICATION NUMBER: B16-SD-YY where B-16 indicates Building 16, SD denotes soil and YY is the consecutive sample number for that type of sample media for the entire project.

The following information will be marked with an indelible marker on a sample label or a tag affixed to each sample container:

- Sample identification number
- Date and time sample was obtained
- Sampler's initials

A “Sample Tracking Log” will be maintained by the sampling personnel to track all collected samples. The log will contain the following information:

- Sample field identification number
- Sample location
- Date and time sample was obtained

7.10 Sample Locations

A table of all sample identification numbers and a figure indicating approximate locations of the samples will be provided to the surveyor. All soil sample locations will be surveyed by a California licensed land surveyor using the UC grid system.

7.11 Sample Custody

Sample custody is the responsibility of the field crew from the time of sample collection until the samples are delivered to the laboratory, accepted by the laboratory courier service for delivery to the laboratory, or until the samples are accepted for shipment by a commercial courier. Thereafter, the laboratory performing the analysis will maintain custody.

A sample is under custody if one or more of the following criteria are met:

- It is in the sampler’s possession
- It is in the sampler’s view after being in possession
- It is in a designated secure area

A COC form will be the controlling document to ensure that sample custody is maintained. Figure 17 provides an example of a COC form. Sampling personnel will complete the COC form prior to transferring samples to the laboratory. In addition to providing a custody exchange record for the samples, the COC form serves as a formal request for sample analyses.

The COC forms will be completed, signed, and distributed as follows:

- One copy retained by the sample coordinator
- The original sent to the analytical laboratory with the sample shipment

After the laboratory receives the samples, the laboratory sample custodian will inventory each shipment and note on the "Cooler Receipt Checklist" form any discrepancy in the number of samples, temperature of the cooler or broken samples, and other QC issues related to sample custody. The laboratory will immediately notify the project chemist of any problems identified with the shipped samples in order to determine the appropriate course of action.

Each time the sample custody is transferred to a different organization, the custodian transferring custody will sign the COC on the "Relinquished by" line, and the new custodian will sign the COC on the "Received by" line. The date, time and company affiliation will accompany each signature. The laboratory will immediately notify the project chemist in the event the COC is broken. A decision will be made as to the fate of the sample(s) in question on a case-by-case basis. The sample(s) will either be processed "as-is" with custody failure noted along with the analytical data or rejected with resampling scheduled, if necessary. Any non-conformance associated with the samples will be noted by the laboratory in a case narrative and discussed in the cleanup report.

7.12 Sample Packaging and Shipment

Samples will be placed in sample coolers. A temperature blank will be placed in every cooler at the beginning of the sampling before collecting the first sample. All water sample containers will be protected with bubble wrap. Ice, double-bagged in re-sealable bags, will be added to the cooler in sufficient quantity to keep the samples at or less than 6 degrees Celsius for the duration of the shipment to the laboratory. Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage.

When samples are picked up by the analytical laboratory's courier service, the COC form will be signed by the sampler relinquishing the samples and the analytical laboratory's courier receiving them.

7.13 Field Quality Control Checks

The following field quality control (QC) samples will be collected to evaluate precision, accuracy, and representativeness of the sampling and analysis process.

7.13.1 Field Duplicates

Field duplicate samples will be collected at a minimum frequency of 1 per 20 samples. Although contamination in soil and concrete is heterogeneous, the field duplicates will assist to evaluate overall sampling and analysis precision as well as representativeness of sample results.

Figure 17. Example Chain of Custody Form

Chain-of-Custody Form

Project Number:		Project Name: Old Town Demolition Phase 1				No. of Containers	Request for Analysis							Chain-of-Custody No.:
Sampler's Name														Page _ of _
Field Sample ID	Date	Tim e	Comp.	Grab	Matrix									Additional Requirements
Relinquished by: *(Signature and affiliation)*					Date and Time:	Received by: (Signature and affiliation)								Date and Time:
Relinquished by: *(Signature and affiliation)*					Date and Time:	Received by: (Signature and affiliation)								Date and Time:
Relinquished by: *(Signature and affiliation)*					Date and Time:	Received by: (Signature and affiliation)								Date and Time:
Notes: Data package(circle one): Level III Level IV Turnaround time:														For Laboratory Use Only

7.13.2 Matrix Spike and Matrix Spike Duplicates

Although soil is heterogeneous, matrix spike and matrix spike duplicates will be analyzed to evaluate the effects of sample matrix on the performance of the PCB analysis. Soil samples submitted for matrix spike (MS) and matrix spike duplicate (MSD) analysis will be composited at the laboratory before preparation and analysis. The matrix spike will evaluate the potential bias that may affect accuracy and the matrix spike duplicate will evaluate the precision of the preparation and analysis procedures, as discussed in Section 10.2. The MS/MSD will be collected at a frequency of five percent of the total soil samples. The soil samples for MS/MSD analysis will be noted on the COC form.

7.13.3 Equipment Blanks

Equipment rinsate blanks will be collected during soil and concrete sampling to assess the effectiveness of the decontamination process. To collect the equipment blank, a sample of analyte free water (deionized water) will be poured through decontaminated field sampling equipment prior to the use of the equipment to collect the next sample. The equipment blank will be collected into a 1-liter amber bottle for analysis of PCBs by EPA Method 3520C/8082A. Equipment blanks will be collected at a frequency of one per day for each type of non-disposable equipment used to collect soil samples.

7.14 Field Deviations

Field conditions at the time of sampling may dictate that the actual samples be collected using techniques not described in this cleanup plan, or ones that are otherwise not in conformance with the approach described. Any deviation from this cleanup plan will be performed in consultation with and approval by LBNL, DOE, and EPA. If deviations from this plan are required, EPA will be notified and a mutually agreeable alternative will be developed subject to EPA’s approval. All deviations will be reported in the cleanup report.

8 HEALTH, SAFETY, AND ENVIRONMENTAL PROTECTION

As discussed below, the cleanup will be conducted in a manner that is protective of worker safety, worker and public health, and of the environment, and in a manner that avoids unreasonable risks to human health and the environment.

8.1 Worker Safety

All activities performed in support of this cleanup plan will be conducted in accordance with the *DMS Site-Specific Health and Safety Plan* (*SSHASP*) (DMS, 2015e) and work packages that include task-specific hazard analyses. The purpose of the SSHASP is to provide information and direction to the Old Town Demolition Project team, contractors, and general visitors regarding the hazards associated with the investigation, deactivation, demolition, site remediation operations, and hazardous waste disposal activities at the site, as well as the approach to minimize personnel exposure to these potential hazards.

The SSHASP meets the requirements contained in the Occupational Safety and Health Administration's 29 CFR 1926, "Safety and Health Regulations for Construction," and DOE's 10 CFR 851, "Worker Safety and Health Program." The SSHASP also meets the State of California Department of Industrial Relations requirements for worker safety in Title 8 of the California Code of Regulations.

The requirements of the SSHASP apply to all personnel that are working at or visiting the Site. This includes, but is not limited to, personnel from DMS, LBNL, DOE, state and federal regulators, subcontractors, and authorized visitors. The Site is not accessible to the general public.

8.1.1 Potential Hazards

The following two principal categories of hazard sources are associated with the project:

- **Physical hazards associated with soil remediation:** remediation operations at the Site present physical hazards associated with working outdoors, operating and working around heavy equipment, lifting and moving materials, and other hazards typically found on construction and demolition sites.
- **Chemical and radiological hazards:** Chemical and radiological contaminants will be encountered during cleanup of the Site, including the contaminants known to be present in soil and concrete. The sources and locations of the contaminants are also listed in Table 7.

Prior to initiating cleanup tasks at the Site, the tasks will be evaluated by the project safety officer for safety and health risks. The project safety officer will monitor Site conditions during the cleanup to identify any unforeseen hazards. All efforts will be made to identify all potential hazards associated with the tasks. Steps that will be implemented to control known and unanticipated hazards are discussed in the following section.

Table 7. Hazardous Materials Present at the Phase 1 Old Town Demolition Project

Hazardous Materials	Source or Location
Silica dust	Concrete and similar substrates contain crystalline silica
Radioactivity	Sanitary sewer piping Concrete slab in radioactive waste yard where spills may have occurred Soil where spills and leaks may have occurred
PCBs	Soil under and around building slabs, particularly near utility trenches and oil pipes PCB impacted soil resulting from spills beyond building slabs
Metals, including mercury	Contamination in the sewer line Contamination in the concrete slab
Volatile Organic Compounds and Petroleum Hydrocarbons	Soil under building slab

8.1.2 Hazard Controls

Measures for controlling specific hazards anticipated during soil remediation are described in the SSHASP. Job-specific hazards and applicable hazard controls will be included in job-specific work packages developed for each activity associated with implementing this cleanup plan. The following major categories of hazard controls will be evaluated and included in the work packages:

- **Elimination of hazards**: Elimination of hazards is the highest priority and will be assessed as the first option.
- **Engineering controls:** If hazards cannot be eliminated, the preferred method is for mitigation with engineering controls. Engineering controls may include, for example, wetting of soils to eliminate dust generation, or the erection of barriers and barricades to prevent access.
- **Administrative controls and general work practices:** The second method to prevent or mitigate a hazard is the use of administrative controls, including general work practices. All personnel are required to understand and follow the health and safety controls that govern work. All personnel are required to comply with job hazard analyses, work control procedures, and any additional applicable requirements. All personnel will attend daily briefings and safety meetings as appropriate for their assigned activities (*e.g.* clerical personnel would not typically attend the morning pre-job briefing but would attend relevant safety meetings). All site personnel are authorized to stop work if they have a reasonable belief that it poses an imminent danger, a life-threatening situation, or other serious hazard.
- **Personal protective equipment:** PPE is the last line of defense to control exposure to hazards. When using PPE, workers shall know the use and protection limits of the PPE, use the proper PPE assigned for the task or area, ensure that the PPE fits properly, ensure that the PPE is free from defects, leave the area immediately if the PPE is damaged, and inspect other worker's PPE and inform them of any problems.

8.2 Public Safety

Public safety will be ensured by restricting access to the Site during demolition, cleanup, sampling, and restoration work, and by ensuring that PCBs do not leave the Site in fugitive dust emissions in greater than allowable concentrations. The methods of controlling and monitoring emissions are described in the following subsections.

The Site is located within the LBNL Facility, to which access by the general public is restricted. To protect non-project LBNL workers and visitors, the Site has been fenced off within the Facility, and access to the Site is restricted to the Old Town Demolition Project team.

8.2.1 Air Monitoring

Dust monitoring will be implemented during demolition activities that may generate particulate emissions. The objective of the monitoring is to provide real-time data that will trigger additional dust control measures listed in the *DMS Air Monitoring and Dust Control Plan* (DMS, 2015f) when necessary to protect the public at LBNL and beyond from emissions of dust that may contain PCBs.

Two perimeter air monitoring stations will be established: one upwind and one downwind of the demolition work area to provide continuous monitoring for particulate matter up to 10 microns in size PM10 as a proxy for PCB emissions. Although the standards (listed in Table 8) are not directly enforceable to construction projects, dust emissions from the project will be monitored and dust suppression efforts will be increased if these limits are exceeded. Given that fine particulate matter (up to 2.5 microns in size [PM2.5]) is mostly derived from combustion sources, emissions of PM10 will be monitored.

In addition to monitoring PM10 emissions, visible dust will be limited consistent with the Bay Area Air Quality Management District's Rule 1, General Requirements of Regulation 6, Particulate Matter.

Table 8. Ambient Air Quality Standards for Particulate Matter

Pollutant	California Standards	National Standards
	Concentration (24-Hour Average)	
Particulate matter up to 10 microns in size (PM10)	50 μg/m^3	150 μg/m^3

8.3 Environmental Controls

Controls will be implemented as discussed below to prevent the spread of PCBs beyond the contaminated area.

8.3.1 Contamination Control

The spread of PCBs within and beyond the Site will be avoided by 1) restricting Site access; 2) limiting and controlling points of access; 3) cleaning equipment, such as drill rigs, excavators, and trucks, as described in Section 4 above to prevent tracking of contaminated soil off-site or around the Site; 4) decontaminating sampling equipment after use as described in Section 7.5; and 5) erosion and sediment control measures per the *Stormwater Pollution Prevention Plan* (SWPPP) (DMS, 2015c) as described below.

8.3.2 Storm Water Pollution Prevention

Storm water pollution prevention will be accomplished in accordance with the SWPPP (DMS, 2015c). The SWPPP was prepared in compliance with the state's *General Permit for Storm Water Discharges*

Associated with Construction and Land Disturbance Activities (SWRCB, 2012), referred to as the *General Construction Permit*.

The SWPPP was prepared to address storm water management for the entire Old Town Demolition project, including Phase I. With respect to the activities proposed in this cleanup plan, the following summarizes the best management practices (BMPs) planned for concrete demolition and soil excavation. Minimum BMPs will be implemented per the BMP Consideration Checklist included in the SWPPP, which lists specific BMPs to be considered for the project. Prior to each forecasted rain event, the activities at the Site will be evaluated and specific BMPs will be selected and documented in a rain event action plan.

A qualified storm water professional will visit the Site weekly, at a minimum, and more often when rain events are predicted. The qualified storm water professional will work with the project team to assess BMPs appropriate for the anticipated work. The selected BMPs will be documented on a Site figure to be used by field staff to ensure correct BMP implementation.

Sufficient materials will be maintained on-site to allow their deployment prior to forecasted rain and for rapid response to failures or emergencies.

8.3.2.1 Erosion Control

Erosion control measures protect the soil surface by covering and/or binding soil particles to prevent them from becoming transported in storm water runoff. The following erosion control BMPs will be implemented during the cleanup:

- **Stabilization** of areas as soon as feasible after the cessation of construction activities.
- **Preservation of existing vegetation** to the largest extent possible.
- **Scheduling** of construction activities to incorporate both soil stabilization and sediment control measure BMPs to reduce the discharge of pollutants. The schedule will limit exposure of disturbed soil to wind, rain, and storm water run-on and run-off and minimize soil disturbing activities.
- Installation of **erosion control blankets** and **lining swales** with **straw waddles**. **Erosion control matting** shall be installed on all new cut and fill areas with slopes of two to one or greater and other areas identified by the qualified storm water practitioner.
- Where demolition work is deemed substantially complete by the LBNL Project Manager, seed will be applied during the rainy season to protect disturbed soil areas from erosion. The **hydro-seeding** materials will be applied after grading operations. The seed mixture will be determined by the qualified storm water practitioner in consultation with LBNL's Facilities Division staff responsible for landscaping. The application of erodible landscape materials will be discontinued within two days before a forecasted rain event or during periods of precipitation. All erodible landscape materials will be covered when not being used.
- Application of **compost blankets** to protect disturbed soil areas from soil erosion, as an alternative to hydro-seeding, where hydro-seeding is not appropriate.
- At completion of construction, application of **permanent erosion controls** to all disturbed soil slated to remain.

8.3.2.2 Sediment Control

Sediment controls are structural measures intended to complement and enhance erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil and concrete particles that have been transported by the force of water. The BMPs that apply to the project include:

- Placement of **fiber rolls**.
- Installation of **silt fence** within two feet of the outside perimeter of the fiber rolls.
- Installation of **gravel bag berms** along the down-gradient perimeter of the project site, along the perimeter of truck staging and loading areas, and surrounding stockpiles.
- **Street sweeping** throughout the active portion of the Site where noticeable tracking of materials onto paved roads occurs. Street sweeping will be performed daily, if needed, from the beginning of demolition activities until completion of the project.
- Before beginning demolition operations, **protection of all drain inlets** within the Site with filter fabric to filter out sediment and pollutants from the storm water. All inlet protection will be installed in a manner that will not cause ponding or pose a threat to traffic safety. If ponding occurs corrective actions will be taken.
    - Placement of **impermeable plastic membranes** to capture potentially contaminated sediment.

8.3.2.3 Treatment to Remove Contaminated Sediments

Because rainwater may accumulate in open excavations during the cleanup and become contaminated, LBNL plans to treat the water in accordance with a special discharge permit issued by EBMUD. Rainwater will be stored in 21,000-gallon tanks, filtered to remove sediments; passed through activated carbon to remove organic contaminants, including PCBs; and treated with Zeolite media bed to reduce dissolved metals that may be present. Prior to discharge of the effluent to the sanitary sewer, the water quality will be tested and only discharged if the effluent meets the EBMUD's permit conditions. The testing will include analysis for PCB congeners specified in the permit. At the completion of the project the sediments and sludge that may have accumulated in the holding and treatment tanks will be removed, analyzed, and disposed of appropriately. The treatment system will be decontaminated as described in Section 4. To reduce the volume of water to be removed from the excavation area for treatment, excavations will be covered as much as possible with plastic sheeting, trench plates, or other methods to reduce the accumulation of rainwater.

8.3.2.4 Tracking Control

For the majority of the project, trucks will be loaded on paved surfaces to eliminate the potential for track-out of mud or dirt. Regular sweeping discussed above will prevent tracking of sediment. If potentially contaminated soils are tracked onto paved areas, the soil will be swept up and placed in a 55-gallon drum or other appropriate container meeting DOT specifications for this type of waste (see Section 5.3.1) and sampled, if time permits, or disposed as PCB remediation waste presumed to contain PCB at concentrations greater than 50 mg/kg. Alternatively, the soil could be placed directly in a truck being loaded with soil with greater than 50 mg/kg of total PCBs and transported to a disposal facility.

8.3.2.5 Wind Erosion Control

A water truck or other means of dust suppression (*e.g.*, hose) will be deployed to apply water to exposed soil, as well as during trenching, grading, and other soil disturbing activities, to prevent wind erosion and sediment dispersion. Such soil misting will be conducted in manner that ensures that no runoff is created.

8.3.2.6 Waste Management

Waste management will include the following measures to prevent contaminants from coming in contact with storm water runoff:

- **Placement of concrete and soil directly into trucks** for proper disposal.
- **Moving all waste disposal containers** to the WAA as described in Section 5.3.2
- Storage of **hazardous materials in tightly closed containers** in a WAA described in Section 5.3.2.

9 LABORATORY ANALYSIS

All analytical services specified in this cleanup plan, except PCB analysis of wastewater discharged to the sanitary sewer, will be performed by Curtis and Tompkins Ltd. in Berkeley, California. Curtis and Tompkins is certified by the American Association for Laboratory Accreditation to perform PCB analysis by EPA Method 8082A. The analytical laboratory is also certified under the Department of Defense National Environmental Laboratory Accreditation Program, which meets the requirements of the Department of Defense and Department of Energy *Consolidated Quality Systems Manual* (*QSM*) *for Environmental Laboratories* (DOE, 2013). The certificate (number L2442), expiring December 23, 2016, is provided in Appendix H. The laboratory is also accredited by the California State Environmental Laboratory Accreditation Program. The state certificate (number 2896), with a renewal required on January 31, 2017, is also included in Appendix H. Further, Curtis and Tomkins is accredited by the National Environmental Laboratory Accreditation Program (NELAP) through the Oregon National Environmental Laboratory Accreditation Program (see Appendix H for documentation).

Although radiological analyses are not required by this cleanup plan, samples will be collected in the former waste processing yard and east of Building 5, which is known to contain low-level radiological contamination. Curtis and Tompkins holds a license (number 3136-01), issued by the California Department of Public Health, to receive, use, possess, transfer, or dispose of radioactive material. Conditions of the radioactive material license will be adhered to in order to control the amount of radioactive materials the laboratory may have in their possession at any given time.

Curtis and Tompkins is capable of providing the 15 business day required turnaround time for analysis and data deliverables required in this cleanup plan. However, if required, PCB preparation and analysis may be conducted on a 72-hour rush turnaround. Curtis and Tompkins will be advised in advance of any samples requiring a rush turnaround time. The quantity of samples requiring a rush turnaround time is not anticipated to exceed 20 samples per day; however, the sample quantity will be discussed with Curtis and Tompkins before collection.

Vista Analytical in El Dorado Hills, California, under a subcontract with Curtis and Tompkins, will perform analysis of treated water by EPA Method 1668 for compliance with the requirements of the special discharge permit issued by EBMUD. The samples sent to Vista will be scanned to ensure they are not radiologically impacted and to conform to the DOT's shipping requirements. If the treated water is determined to be radiologically impacted, the samples will be analyzed by Curtis and Tompkins, as required for disposal. Vista is accredited to perform PCB analysis by EPA Method 1668 in compliance with ISO IEC 17025:2005, the 2009 NELAC Standard, and the requirements of the National Environmental Laboratory Accreditation Program (Certificate Number: 3091.01, valid to September 30, 2017).

Radiochemical analysis – if necessary – will be performed by GEL Laboratories, LLC located in Charleston, South Carolina. GEL is an accredited under the State of California Department of Health Services Environmental Laboratory Accreditation Program and the Department of Defense National Environmental Laboratory Accreditation Program. Additionally, GEL Laboratories is accredited under the Department of Energy Consolidated Audit Program.

The analytical laboratories will receive a copy of the final cleanup plan including any revisions and amendments. At the analytical laboratories, the project manager is responsible for its implementation.

9.1 Analytical Parameters and Methods

Laboratory procedures, including sample preparation, cleanup, and analysis, will be conducted in compliance with the analytical and test methods in the latest version of the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846) (EPA, 2014a) as minimum requirements. In addition – to meet DOE's quality control requirements – each step of the sample preparation and analysis will conform to the specific quality control requirements of the QSM. The most stringent requirement of the SW-846, the QSM, or as specified herein, shall control. The analytical procedures for PCB Aroclors are discussed below. Congener analysis will be conducted in conformance with the QSM, and is briefly discussed.

9.1.1 Sample Preparation

Approximately 30 grams for soil and 15 grams for concrete samples are required for the Soxhlet extraction. For this cleanup plan a minimum of 50 grams of soil will be collected. The analytical laboratory will be instructed to homogenize the entire volume of sample provided before obtaining the necessary aliquot for the Soxhlet extraction. For liquid samples, including equipment blanks, approximately one liter of water is required for extraction. Extraction and cleaning to remove potential interferences will be conducted for all samples by the following methods:

- EPA Method 3540C, Soxhlet Extraction for Soil and Concrete Samples
- EPA Method 3520C, Continuous Liquid-Liquid Extraction for Water Samples
- EPA Method 3580A, Waste Dilution (oil/hydraulic fluids/coolants)
- EPA Method 3550C, Ultrasonic Extraction (wipes)
- EPA Method 3665A, Cleanup of Extracts with Sulfuric Acid
- EPA Method 3660B, Sulfur Cleanup with Copper Option

As noted, per EPA Method 3665A, additional organochlorine pesticides will be removed from the extract using Florisil Cleanup (Method 3620) or Silica Gel Cleanup (Method 3630). These additional cleanup methods will be employed if necessary before analysis to achieve the required reporting limits described in Section 9.3. Similarly, the laboratory will be instructed to utilize a gel permeation chromatography if sample interferences make it difficult to achieve the required reporting limits described in Section 9.3.

9.1.2 Sample Analysis

Soil, concrete, wipe, and liquid samples (except sampling for discharge to the sanitary sewer) will be analyzed for PCBs by EPA Method 8082A. Soil and concrete samples will be reported on a dry-weight basis. Samples of treated water to be discharged to the sanitary sewer will be analyzed by EPA Method 1668 per the permit from EBMUD (see Appendix G).

9.2 Laboratory Quality Control Checks

The recovery of known additions is part of the laboratory's analytical protocols. The use of additives at known concentrations allows the detection of matrix interferences and estimating the impact of these interferences when present. It also allows evaluation of the efficiency of extraction procedures and overall accuracy of analysis. The following laboratory internal QC checks will be included in the analytical reports:

- Laboratory control samples (LCS)
- Laboratory control duplicates (LCD) for analysis per EPA Method 8082 only
- Surrogate standards
- Method blanks
- Initial calibration and continuing calibration
- Establishment of position and width of retention time window
- Laboratory QC checks for compound identification

Decisions related to data quality will be made based on laboratory QC samples described in the following sections. The analytical laboratory will prepare a narrative with each laboratory report discussing any problems encountered during analysis or with the QC samples, and a discussion of how the problems were addressed.

9.2.1 Laboratory Control Samples

Laboratory control samples are matrix-equivalent QC check samples (such as analyte-free sand) spiked with a known quantity of specific analytes that are carried through the entire sample preparation and analysis process. The spiking solution used for LCS/LCD preparation is of a source different from the stock used to prepare calibration standards.

Analytical accuracy (discussed in Section 10.2.2) will be represented by the recovery of the spiked compound in the LCS/LCD. Percent recovery criteria for LCS/LCD sample results will be evaluated using the limits provided in Appendix C of the QSM. Results may not be reported without a valid LCS that is within the limits specified in Appendix C of the QSM. Data qualification is only appropriate in cases in which the sample cannot be reanalyzed.

The laboratory will evaluate analytical precision (see Section 10.2.1) based on the relative percent difference (RPD) of the LCS/LCD pair. The LCS/LCD pairs will be evaluated using the RPD criterion of less than or equal to 30 percent as provided in Appendix B, Table 1 of the QSM.

9.2.2 Surrogate Standards

Organic compound analyses include the addition, quantitation, and recovery calculation of surrogate standards. Compounds selected to serve as surrogate standards must meet all of the following requirements:

- Are not the target analytes
- Do not interfere with the determination of target analytes
- Are not naturally occurring, yet are chemically similar to the target analytes
- Are compounds exhibiting similar response to target analytes

Surrogate standards are added to every analytical and QC check sample at the beginning of the sample preparation. The surrogate standard recovery is used to monitor matrix effects and losses during sample preparation. Surrogate standard control criteria are applied to all analytical and QC check samples, and if the laboratory's statistically based surrogate criteria are not met, re-extraction and/or reanalysis may be performed.

The laboratory will also evaluate analytical accuracy (see Section 10.2.2) based on the recovery of surrogate standards. Percent recovery for surrogate results will be evaluated using the limits provided in Appendix C of the QSM; however, a minimum of 30 percent surrogate recovery is required for decachlorobiphenyl instead of the laboratory's statistically-based control limit for surrogate recoveries. Otherwise, the laboratory's statistically-based control limit may be used if a limit is not specified in Appendix C of the QSM.

If surrogate recovery results are outside of the limits specified in Appendix C, re-extraction and/or reanalysis will be conducted if sufficient sample is available. If obvious chromatographic interferences are present, reanalysis may not be necessary.

9.2.3 Method Blanks

A method blank is used to monitor the laboratory preparation and analysis process for interferences and contamination from glassware, reagents, sample handling, and from the general laboratory environment. A method blank is carried through the entire sample preparation, cleanup, and analysis process, and is included with each batch of samples. An acceptable method blank must not have analytes detected greater than half the limit of quantitation or greater than 1/10 of the amount measured in any sample, or 1/10 of the regulatory limit (or 0.094 mg/kg for solid samples), whichever is greater.

Results may not be reported without a valid method blank. Data qualification is only appropriate in cases where the samples cannot be reanalyzed.

9.2.4 Initial and Continuing Calibration Checks

Instrument calibration is conducted to ensure that the instrument is capable of producing acceptable qualitative and quantitative data. A five-point initial calibration is required for all Aroclors and surrogates on both the primary column used for quantitation and the confirmation column. Initial calibration options 1 and 2 specified in Table 1 of Appendix B of the QSM must be met before proceeding with analysis of QC and field samples.

An initial calibration verification standard will be analyzed once after each initial calibration. The initial calibration verification shall be from a different source than the initial calibration standards. All reported analytes in the initial calibration verification must be within the established retention time windows and reported concentrations must be within 20 percent of the true value. No samples shall be analyzed until the initial calibration verification meets the stated criteria.

A continuing calibration check is conducted to ensure that the instrument continues to meet the sensitivity and linearity criteria to produce acceptable qualitative and quantitative data throughout each analytical sequence. The continuing calibration verification is required to be conducted before and following every 10 samples analyzed for PCBs. All reported analytes and surrogates are to be within the established retention time windows and plus or minus 20 percent difference of the initial calibration both columns. Sample results may not be reported without a valid continuing calibration verification. Only in cases where re-extraction and/or reanalysis are not possible, are sample results to be reported following an invalid continuing calibration verification.

9.2.5 Retention Time Windows

The retention time window position shall be set using the midpoint standard of the initial calibration curve when initial calibration is performed. On days when initial calibration is not performed, the retention time window position shall be set using the first continuing calibration verification standard analyzed. The retention time window width is plus or minus 3 times the standard deviation for each analyte retention time from the 72-hour study. Retention time windows shall be calculated for each analyte and surrogate.

9.2.6 Compound Identification

In accordance with the QSM, all positive results will be confirmed on a second column. The RPD between the primary and secondary column will be compared to less than or equal to 40 percent. Re-extraction, cleanup, and/or reanalysis may be necessary. If the RPD criterion is exceeded after re-extraction, cleanup, and/or reanalysis, the primary column will be reported. Where instrument sensitivity permits, a different instrument combination such as gas chromatography/mass spectrometer may be used to confirm analyte identification. All detected analytes must be confirmed.

9.3 Reporting Limits

The laboratory will determine the detection limits for each Aroclor and matrix by using the procedure described in 40 CFR Part 136, Appendix B or another scientifically valid and documented procedure. The detection limit is defined as the smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration at the 99 percent level of confidence.

The limit of quantitation (LOQ) is the lowest concentration of a substance that produces quantitative result within specified limit of precision and accuracy. The LOQ shall be set at or greater than the concentration of the lowest initial calibration standard and must be within the calibration range.

Once the LOQs have been established, laboratories routinely use them as reporting limits in the analysis of interference-free, undiluted samples. The LOQs, however, are highly matrix-dependent and their values increase with sample dilution. As shown in Table 9 below, the Curtis and Tompkins' LOQs are sufficiently below the site cleanup goal of 0.94 mg/kg for solid samples. These limits are based on a 30-gram soil or 15-gram concrete sample prepared by Soxhlet extraction with no dilution. All solid samples will be reported on a dry weight basis; therefore, these values are the lowest reporting limits for the project samples.

Table 9. Limits for Reporting of Solid Sample Results

Analyte	CAS Number	Limit of Quantitation (mg/kg)
Aroclor 1016	12674-11-2	0.012
Aroclor 1221	11104-28-2	0.024
Aroclor 1232	11141-16-5	0.012
Aroclor 1242	53469-21-9	0.012
Aroclor 1248	12672-29-6	0.012
Aroclor 1254	11097-69-1	0.012
Aroclor 1260	11096-82-5	0.012
Aroclor 1268	11100-14-4	0.012
Total Polychlorinated Biphenyls	Not Applicable	–

Notes:
CAS Chemical Abstract Service
mg/kg milligrams per kilogram

As shown in Table 10 below, the Curtis and Tompkins' LOQ for liquid samples analyzed by Method 8082A are sufficiently low for decisions regarding liquid PCBs waste that is not discharged to the sanitary sewer. Water samples will be extracted using continuous liquid-liquid extraction from an approximately one-liter sample. Assuming no dilutions are required and one liter of water was collected for each sample, the lowest report limit for water samples are listed in the table below.

Table 10. Limits for Reporting Results of Liquid Samples

Analyte	CAS Number	Limit of Quantitation (µg/L)
Aroclor 1016	12674-11-2	0.5
Aroclor 1221	11104-28-2	0.1
Aroclor 1232	11141-16-5	0.5
Aroclor 1242	53469-21-9	0.5
Aroclor 1248	12672-29-6	0.5
Aroclor 1254	11097-69-1	0.5
Aroclor 1260	11096-82-5	0.5
Aroclor 1268	11100-14-4	0.5
Total Polychlorinated Biphenyls	Not Applicable	–

Notes:
CAS Chemical Abstract Service
µg/L micrograms per liter

As shown in Table 11 below, the Curtis and Tompkins' LOQ for wipe samples analyzed by Method 8082A are sufficiently low for decisions regarding the final disposition of non-porous PCBs waste (10 µg/100 cm^2).

Table 11. Limits for Reporting Results of Wipe Samples

Analyte	CAS Number	Limit of Quantitation (µg/wipe)
Aroclor 1016	12674-11-2	0.25
Aroclor 1221	11104-28-2	0.5
Aroclor 1232	11141-16-5	0.25
Aroclor 1242	53469-21-9	0.25
Aroclor 1248	12672-29-6	0.25
Aroclor 1254	11097-69-1	0.25
Aroclor 1260	11096-82-5	0.25
Aroclor 1268	11100-14-4	0.25
Total Polychlorinated Biphenyls	Not Applicable	--

Notes:
CAS Chemical Abstract Service
µg/wipe micrograms per wipe

Vista Analytical can meet the reporting limits for liquid samples analyzed by Method 1668 necessary to determine whether treated water from the project may be discharged to the sanitary sewer. The PCB congener reporting limits will be at least one order of magnitude lower than the discharge limit of 0.017 µg/L specified in the permit issued by EBMUD.

10 DATA MANAGEMENT

The procedures for management of PCB Aroclor data are discussed below. Data related to PCB congeners will be managed in conformance with the QSM, and is only briefly discussed.

10.1 Assessment and Oversight

A DMS technical project manager will oversee the data collection and a qualified DMS chemist will oversee the data validation. The chemist will act as liaison between the sampling technicians and the analytical laboratory, and between the analytical laboratory and the reporting team. The chemist will support the field sampling team with sample numbering and labeling to ensure that unique sample numbers are generated and included on labels; will review chain-of-custody documents to ensure that cooler temperature is within the specified range, the number of containers is correct; the sample numbers are correctly entered; and the correct analysis is requested. The chemist will coordinate with the laboratory project manager to confirm sample receipt and proper sample handling. Once the analytical laboratory completes the analysis, the DMS chemist will ensure that the proper electronic data deliverables are provided and will start the data validation process as described in Section 10.2 below.

10.2 Data Validation and Usability

The purpose of quality assurance and QC procedures is to produce data of known and acceptable quality by satisfying specified indicators of precision, accuracy, representativeness, comparability, and completeness (data quality indicators) discussed below.

10.2.1 Precision

Precision is the degree to which the analytical measurement is reproducible (*i.e.* that there is agreement between replicate measurements made under similar conditions for the same property). This is a measure of random error and can result from problems with sampling procedures, preservation, storage, shipment, preparation or analysis. Reproducibility among duplicate samples provides a determination of precision, which can be expressed as the relative percent difference in the amount of detected compounds between the original and duplicate samples. The RPD is quantified by the following equation:

$$\mathrm{RPD} = \frac{C_1\text{-}C_2}{C_1 + C_2/2}\ x\ 100$$

where:

RPD = Relative percent difference
C_1 = Larger of the two observed values
C_2 = Smaller of the two observed values

Precision will be evaluated using field duplicate results; matrix spike and matrix spike duplicate results; and laboratory control sample and laboratory control duplicate results. The RPD criterion for this project is 30 percent for all samples.

10.2.2 Accuracy

Accuracy is the evaluation of how close the analytical measurement is to the true value. Accuracy is a combination of random error (precision) and systematic error (bias). Accuracy for laboratory analytes is determined by comparing measured concentrations in a sample matrix against the measured concentration in a matrix spiked with a known amount. The formula for determining accuracy is:

$$\text{Percent Recovery (\%)} = \frac{(B - A) \times 100}{T}$$

where:

B = measured concentration of spiked samples
A = measured concentration of un-spiked samples
T = true spiked concentration

Accuracy will be evaluated based on the percent recovery results for laboratory control samples and laboratory control duplicates. Accuracy will also be evaluated based on the recovery for surrogate spike standards (decachlorobiphenyl and 2,4,5,6-tetrachloro-m-xylene in soil, concrete and wipe samples; decachlorobiphenyl only in water samples). The percent recovery criteria for surrogates are as follows:

- Decachlorobiphenyl: 30 to 135 percent for solid samples
- Decachlorobiphenyl: 40 to 135 percent for water samples
- 2,4,5,6-Tetrachloro-m-xylene: 44 to 130 percent for solid samples

If surrogate sample recoveries fall below 65 percent, sample data will be reviewed to evaluate the potential for false negative data. If the surrogate sample recoveries fall below 30 percent for decachlorobiphenyl or 44 percent for 2,4,5,6-Tetrachloro-m-xylene, the data will be considered rejected and samples will be re-extracted and/or reanalyzed. If, following reanalysis, samples are rejected, the rejection and the reason for it will be documented in the laboratory's narrative and validation package, and will be documented in the cleanup report.

If laboratory control sample percent recovery is outside the control limits specified in Table 17 in Appendix D of the QSM, the data will be considered rejected and samples will be re-extracted and/or reanalyzed. If matrix spike sample percent recovery is outside the control limits specified in Table 17 in Appendix D of the QSM, or matrix spike/matrix spike duplicate RPD is greater than 30 percent, the data shall be evaluated to determine the source(s) of the difference, (*i.e.,* matrix effect or analytical error).

10.2.3 Representativeness

Representativeness is a qualitative term describing the degree to which sample data typifies the characteristic of interest at the point of interest accurately and precisely. Representativeness of data from field sites is a function of the sampling process design and the sampling procedures, which are designed to optimize the potential for obtaining samples that reflect the true state of the environment while maintaining practicability. The sampling design is described in Section 6.2. Sampling methods are described in Section 7. Analytical results will be verified or validated to ensure representativeness. If during the verification or validation it is determined that results are not representative, reanalysis of the original sample or collection of additional samples for analysis may be required.

10.2.4 Comparability

Comparability is a qualitative term to describe the ability and appropriateness of taking two or more data sets to make collective conclusions. Issues to be considered include variables that could affect the descriptive value of the data for specific parameters at specific times using specific methods.

Considerations include:

- Variables of interest included
- Common units used
- Similarity of methods and quality assurance
- Time frames
- Equipment used

10.3 Data Output and Validation

Stage 4 data packages (as defined in the QSM) are required for verification sample results and any associated equipment blanks. Analytical results for soil, concrete, storm water, and other samples collected for characterization purposes may be provided in stage 3 data packages (as defined in the QSM), instead of stage 4. The data package narrative provided by the laboratory will be completed and signed by the laboratory project manager.

Hardcopy Deliverables. Hardcopy deliverables will include all of the information specified in Sections 1.0 through 6.0 of Appendix A of the QSM. All raw data and documentation, including (but not limited to) logbooks, data sheets, electronic files, and final reports, will be maintained by the analytical laboratory for at least three years. Any analytical issues will be documented in the data package narrative.

Electronic Deliverables. The electronic data deliverable (EDD) will be in the specific file format required for upload by LBNL database personnel described in Appendix I. The analytical laboratory will certify that the results in the EDD and the hardcopy data package reports are identical. DMS, or the validator, will confirm that the results entered into the database and the hardcopy data package reports are identical. A complete listing of the data from the LBNL database will be compared to the hardcopy data following data entry.

Analytical deliverables in the Adobe Acrobat portable document format and EDDs will be catalogued and kept on file at the project site. Data packages in Adobe Acrobat portable document format and EDD deliverables will be transmitted to LBNL.

All analytical data generated by the laboratory will be reviewed prior to reporting to assure data validity. Data validation will be conducted consistent with the process provided in the *National Functional Guidelines for Superfund Organic Methods Data Review* (EPA, 2014b) using the requirements in QSM and any additional requirements specified herein. A data usability summary will be prepared to document the validation. A minimum of 20 percent of the data validation will include a Level IV review and the remaining validation will be conducted at Level III. A third party validation company, not associated with the sampling or analysis, will conduct the validation.

The validation company shall have the following qualifications: minimum of five years of experience in the environmental data validation business; prior experience on Department of Energy projects; and participation in an active peer review program.

Validation staff shall have the following qualifications:

Data Reviewer: Bachelor of Science degree or higher in chemistry or related field and five years of combined experience with approximately two years in data validation and two years conducting laboratory analysis in an environmental laboratory using the EPA-approved methods being validated

Peer Reviewer: Bachelor of Science degree or higher in chemistry or related field and five years of combined experience with approximately two years in data validation and three years conducting laboratory analysis in an environmental laboratory using the EPA-approved methods being validated.

11 DATA ANALYSIS AND REVIEW

Data review and statistical analysis will be performed on final verified and validated PCB Aroclors data sets used to assess compliance with the required cleanup. The data review and analysis process will be conducted under the direction of DMS's technical project manager.

11.1 Data Review

Analytical data and validation reports will be reviewed. Data rejected during validation will be eliminated from the data set used to evaluate whether the cleanup goal has been achieved. Re-analysis or re-collection of samples necessary to complete the evaluation (*i.e.*, valid data for each required verification sample location) will be requested and the data review process will be suspended until all data necessary for the evaluation of cleanup completion are collected, verified, and deemed valid.

A statistical summary of each Aroclor and total PCBs will be prepared for each decision unit, and a statistical summary table will be prepared to include the following:

- Number of samples collected
- Frequency of detections (each Aroclor)
- Range of detection limits (each Aroclor)
- Maximum detected concentration (each Aroclor and total PCBs)
- Mean of detected concentrations (each Aroclor and total PCBs)
- Number of samples above cleanup level (total PCBs)

If any of the total PCB concentrations values exceed the cleanup level, data for the decision unit will be carried forward for statistical analysis described below. A tabulation of all analytical results will be provided in an appendix to the cleanup completion report.

11.2 Statistical Analysis of Sample Data

The statistical software, ProUCL (EPA, 2013), will be used to calculate the 95 percent upper confidence limit on the mean (95UCL) for decision units in which total PCBs results are greater than the cleanup level. The 95UCL will be calculated for total PCBs and not individual Aroclors. The calculation option in ProUCL for all available distribution assumptions will be used to calculate the 95UCL results for a variety of nonparametric calculation methods in addition to results for normal, lognormal, and gamma parametric distributions. The output will also include goodness of fit test results for the parametric distributions and a suggested UCL based on calculated statistics.

Histograms and/or quantile-quantile plots (q-q plots) may be generated to evaluate selected distributions in more detail. The 95UCL suggested by ProUCL will be used for comparison of the data with the cleanup level unless graphical evidence from the histograms and/or q-q plots justify an alternative calculation approach from among the ProUCL output options.

If the ProUCL output indicates that there is an insufficient number of data points to calculate a 95UCL, no additional statistical analyses will be conducted and all sample results in the decision unit will be compared individually to the cleanup level.

The results from this statistical evaluation, along with other required information outlined in Section 6.3, will be used to support a conclusion that a unit has been cleaned up and may be backfilled as approved by EPA.

12 CLEANUP COMPLETION REPORT

The cleanup completion report will be submitted to the EPA within approximately 120 days of the date of EPA's approval of the verification data for the last excavation conducted for the cleanup.

12.1 Overview

The report will document cleanup activities, data analysis, conclusions regarding compliance with the cleanup level, and any land use restrictions required as discussed below. The report will be signed and stamped by a California-licensed Professional Geologist or Professional Engineer. The report will include the following information at a minimum:

- Documentation with maps, tables, and text of the locations, depths, and volumes where soil was excavated;
- Documentation with maps, tables, and text of the locations and depths where samples were collected;
- Copies of all laboratory analytical reports, including COC records;
- Tables with analytical results, including detection limits;
- Final disposition (*e.g.,* specific disposal facility or on-site reuse location(s) of all excavated soil, referenced to the location where the corresponding soil was excavated;
- Final disposition of non-soil waste regulated under TSCA as PCB remediation waste, including sediment and non-porous debris with surface PCBs;
- Sources of and test results for any imported backfill and locations where fill was placed;
- Copies of all applicable profiles, waste acceptance applications and approvals, waste manifests, and transport and disposal documentation for soil and other PCB remediation waste (*e.g.*, debris and sediment);
- Photographic documentation (photograph and date) and documentation of observations of soil management activities;
- Photographic documentation (photograph and date) and documentation of underground utilities from which releases may have occurred;
- Documentation of cap location, dimensions, design, and concentrations of PCBs in soil beneath the cap, if applicable.

Excavations and soil sampling locations will be accurately located and recorded by survey conducted by a California-licensed land surveyor using the UC grid coordinate system. The report will include tabulated records of the northing and easting coordinates and elevations of all surveyed points.

The following subsections provide further details of the report content.

12.2 Cleanup Activities

A cleanup timeline, along with a description of cleanup, decontamination, sampling, and waste disposal will be provided in the cleanup completion report. Interactions with EPA and other regulatory agencies during the cleanup process and the outcomes will be described. Any deviations from the cleanup plan will be described.

Photographs with date and descriptions clearly documenting the cleanup process will be included in an appendix to the report. Copies of waste manifest forms and equipment decontamination records will also be provided in an appendix.

12.3 Data Analysis

The report will contain the data and a description of the data analysis used to determine that cleanup goals were met, including:

- Tabulated verification sampling data showing the location IDs, sample IDs, individual Aroclor results, total Aroclors, decision unit designation, and northing and easting coordinates expressed in the UC grid coordinate system
- Sample location land survey reports with northing and easting coordinates and elevations expressed in the UC grid coordinate system
- Maps showing verification sample locations and results, including spatial analysis (see Section 6.3)
- Statistical (95 percent UCL) calculations; by decision unit if applicable
- Analytical reports
- Data validation reports
- Field sampling records, including chain-of-custody forms, and copies of field log books documenting daily field activities and sampling
- Emails and letters from EPA documenting determinations for each decision unit as to cleanup attainment and approval of backfill or non-attainment of cleanup (see Section 6.3)

12.4 Compliance with Cleanup Plan

A certification by the owner's representative and the contractor of compliance with the approved cleanup plan will be provided in the cleanup completion report.

The completion report will include figures accurately showing the areal extent and depth of excavations where soil impacted with PCBs at concentrations above the cleanup goal has been removed. The figures will also show any areas that were inaccessible for cleanup where PCBs may remain at concentrations greater than the cleanup goal, and any areas where PCB contamination above the cleanup goal extends beyond the Site boundary. If the vertical extents of PCB contamination above the cleanup goal are not accessible for excavation, the depths beyond which additional cleanup may be required will be included on the figures and described in the report narrative. The report will also include the tabulated coordinates of the surveyed boundaries of all excavations and areas described above.

13 INSTITUTIONAL CONTROLS AND MONITORING

It is expected that implementation of this plan will achieve the PCB cleanup goal of 0.94 mg/kg, which is deemed protective for workers and potential ecological receptors, as discussed in Sections 3. It is possible that residual concentrations of PCBs remaining in the soil after the cleanup will be lower than the 0.94 mg/kg cleanup goal and may be at levels protective of residential receptors. If the actual cleanup goal achieved is not protective of residential receptors but meets the prescribed goal of 0.94 mg/kg, no additional cleanup would be required per this cleanup plan as approved by EPA, and land use at the Site would be restricted to industrial and commercial use.

The restriction would be enforced via LBNL's review of development projects for conformance with the 2006 Long Range Development Plan (LBNL, 2006a), which designates the land use at the Facility, adopted environmental reports supporting 2006 Long Range Development Plan (*e.g.*, EIRs), and any institutional controls required to control exposure to environmental contamination at the Facility. The 2006 Long Range Development Plan, which was approved by the Regents of the University of California following review of the 2006 LRDP Environmental Impact Report and governs current land use at the Facility, designates the Site and surrounding areas for research and academic use. Conversion of land at the Site to residential use would require an environmental review, and might trigger additional risk assessment and cleanup.

If residential use were to be prohibited at the Site based on the final outcome of the PCB cleanup, a soil management plan would also be developed to include a prohibition against residential land use, along with a map showing the boundaries and coordinates of the restricted area(s). The soil management plan would be maintained by LBNL, and all development projects would be reviewed for conformance with this plan.

If the prescribed 0.94 mg/kg PCB cleanup goal were not achieved at the Site or portions thereof, LBNL – in consultation with DOE and EPA – would assess the risks of the remaining PCBs to human health and ecological receptors and would evaluate additional remedial actions, including additional soil removal, capping, and/or institutional controls.

If a permanent cap were to be installed at the Site to provide protection for human health and the environment, the requirement to maintain the cap would be specified in the soil management plan. A notation in a deed or on some other instrument normally examined during a title search will be recorded that will in perpetuity notify any potential purchaser of the existence of the cap and the requirement to maintain the cap and the residual contaminant levels left at the Site and/or under the cap consistent with Section 761.61(a)(8).

If PCBs in concentrations greater than the cleanup goal were to remain at the Site, LBNL – in consultation with DOE and EPA – would consider recording a notation in a deed, or in some other instrument which is normally examined during a title search, that would in perpetuity notify any potential purchaser of the residual contaminant levels remaining at the Site, the existence of a cap (if installed), and the requirement to maintain the cap.

14 RECORDKEEPING

LBNL will retain the cleanup completion report, along with records of sampling and analysis, decontamination, cleanup, and disposal of PCBs as described below. Copies of records, if requested, will be made available to EPA. Records will be maintained in accordance with LBNL's records retention policy and project-specific records management requirements. In addition, all records will be retained in accordance with Part 761 as discussed below.

14.1 Sampling and Analysis Records

LBNL will retain records of sampling and analysis including at a minimum: analytical laboratory reports, data validation reports, and field sampling records (including COC forms, daily field reports, and field sampling forms) for a period of at least five years per Section 761.61(a)(9).

14.2 Decontamination Records

If any equipment or items that contained or were exposed to greater than 50 mg/kg or 10 µg/100 cm^2 (for non-porous surfaces) of PCBs were decontaminated and then reused or recycled, LBNL would retain records of the decontamination for a period of at least three years per Section 761.79(f)(2). Decontamination records will be included in the cleanup completion report (see Section 12).

14.3 Cleanup Records

LBNL will retain the cleanup completion report (see Section 12) and any other records of cleanup activities, including documentation with maps, tables, and text of the locations, depths, and volumes where soil was excavated, for a period of at least five years per Section 761.61(a)(9).

14.4 Waste Management, Transportation, and Disposal Records

LBNL will retain waste profiles, manifests, bills of lading, and certificates of disposal per LBNL's records retention policy.

A copy of each signed manifest accompanying PCB waste for off-site disposal will be maintained until LBNL receives a signed copy from the designated disposal facility. LBNL's Waste Management Group will retain the signed copy for at least three years from the date the PCB waste was accepted by the initial transporter. After three years the manifests will be transferred to the LBNL Records and Archive Office.

Certificates of disposal will be retained for at least three years from the date the PCB waste was accepted by the initial transporter.

15 SCHEDULE

From the submittal date of this cleanup plan (February 22, 2016) EPA has agreed to review the plan within 60 days. Presuming the plan is approved, the approval date is expected to be April 19, 2016. The following outlines the projected schedule to complete the cleanup at Building 52/52A and the Electrical Pad.

February 22, 2016	Cleanup plan submittal to EPA
April 19, 2016	Cleanup plan review and EPA's approval
April 20 to April 29, 2016	Site preparation, delineation of excavation areas, set up of decontamination area and lay down areas
April 29 to May 16, 2016	Removal of concrete and soil excavation
May 16 to 27, 2016	Establishment of verification grid and collection of verification samples
May 27 to June 17, 2016	Completion of sample analysis and data validation
June 17 to July 1, 2016	Completion of statistical analysis of data, preparation of data tables and figures for EPA review
July 1 to 15, 2016	EPA review of verification data
July 18 to August 8, 2016	Backfill and site restoration

This schedule presumes that verification sampling will indicate that the cleanup goal has been achieved. If additional soil must be excavated, the schedule will be extended as necessary to accommodate additional cleanup and post-cleanup verification sampling.

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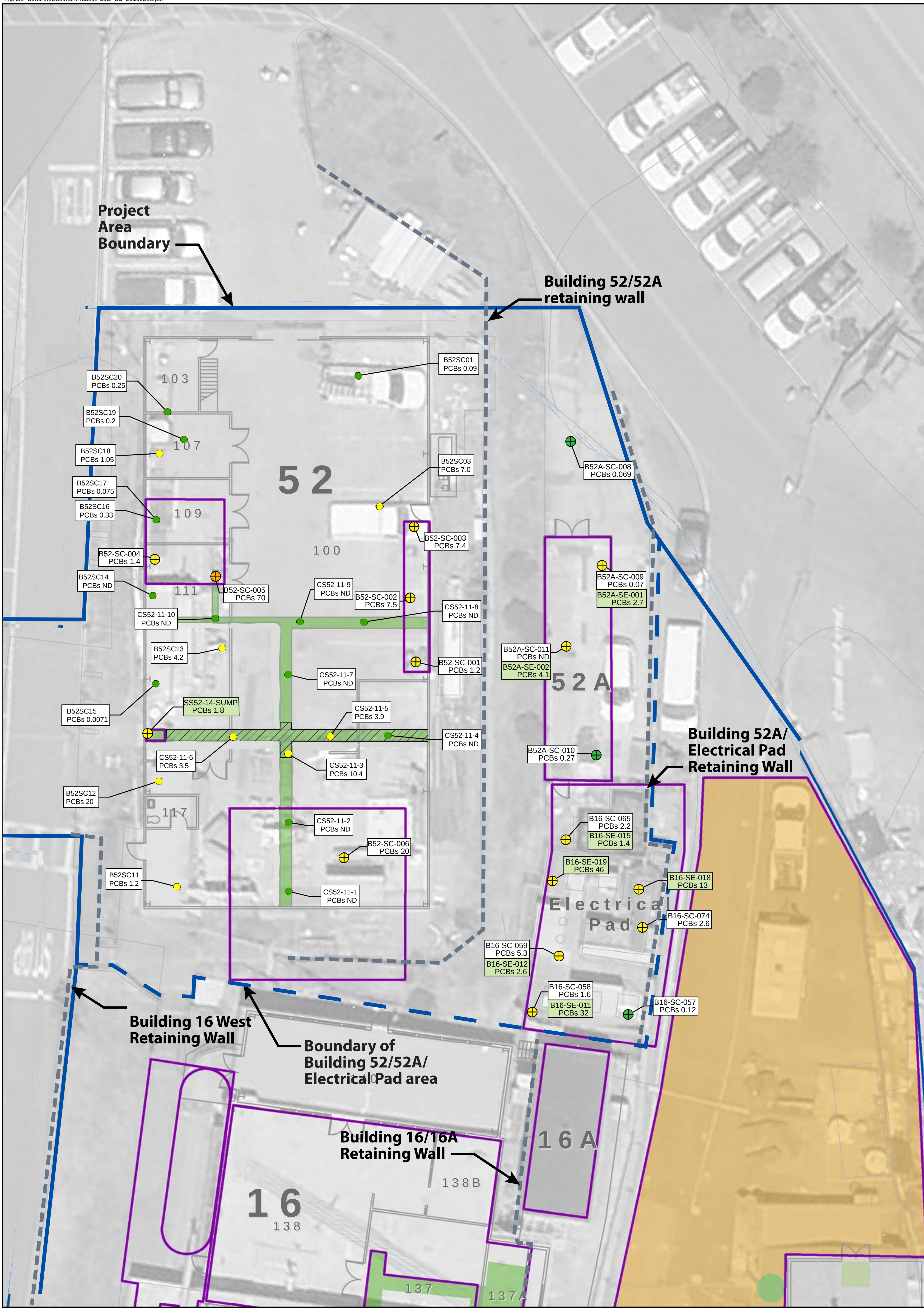
Appendix A. Figures

FigA01_ConcreteSedimentResults B52PCB_20160218.pdf



EXPLANATION

B16-SC-058 PCBs 1.6	Concrete sample result showing sample number, depth of sample (feet), and total PCB concentration (mg/kg)
B16-SE-025 PCBs 16	Sediment sample result showing sample number, depth of sample (feet), and total PCB concentration (mg/kg)
○	Pre-2015 sample location
⊗	2015/2016 sample location
ND	Sample result indicating all PCB aroclors not detected

- Pit/Trench/Vault
- Historical Pit
- Building 5 Radiological Waste Processing Yard
- Project Area
- Area of PCB Use
- Area where concrete trench floor previously removed

Total PCB Concentration Color Coding (Maximum Value for Concrete or Sediment)

- ≤ 0.94 mg/kg
- > 0.94 mg/kg
- > 50 mg/kg

N

0 8 16

Scale in Feet

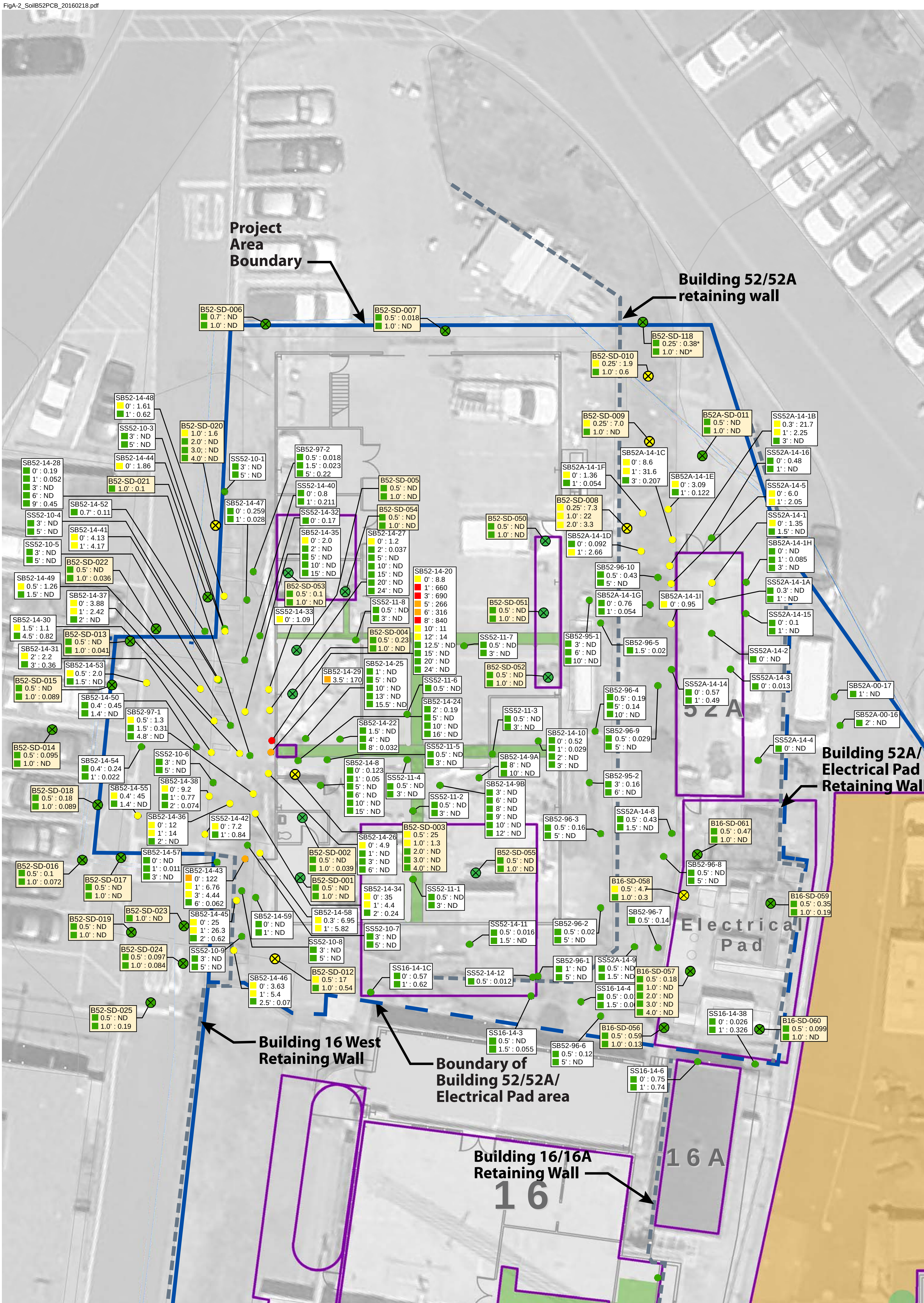
NOTE: Aerial Imagery © 2014 Pictometry

Figure A-1
Total PCB Concentrations in Concrete and Sediment Buildings 52, 52A, and the Electrical Pad

Old Town Demolition Project Phase I

Dynamic Management Solutions, LLC
LBNL Old Town

FigA-2_SoilB52PCB_20160218.pdf



EXPLANATION

- Project Area
- Area of PCB Use
- Pit/Trench/Vault
- Building 5 Radiological Waste Processing Yard

Total PCB Concentration Color Coding

- ≤ 0.94 mg/kg
- > 0.94 mg/kg
- > 50 mg/kg
- > 500 mg/kg

SS52-14-11 1.0' : 0.68 — Pre-2015 sample result showing sample number, depth of sample (feet), and total PCB concentration (mg/kg).

B52-SD-025 1.0' : 12 — 2015 sample result showing sample number, depth of sample (feet), and total PCB concentration (mg/kg).

ND — Sample result indicating all PCB aroclors not detected.

* — Sample B52-SD-118 result is pending analytical data validation

NOTE:
1. Trenches in Building 52 have been removed and backfilled with concrete.
2. Aerial Imagery © 2014 Pictometry

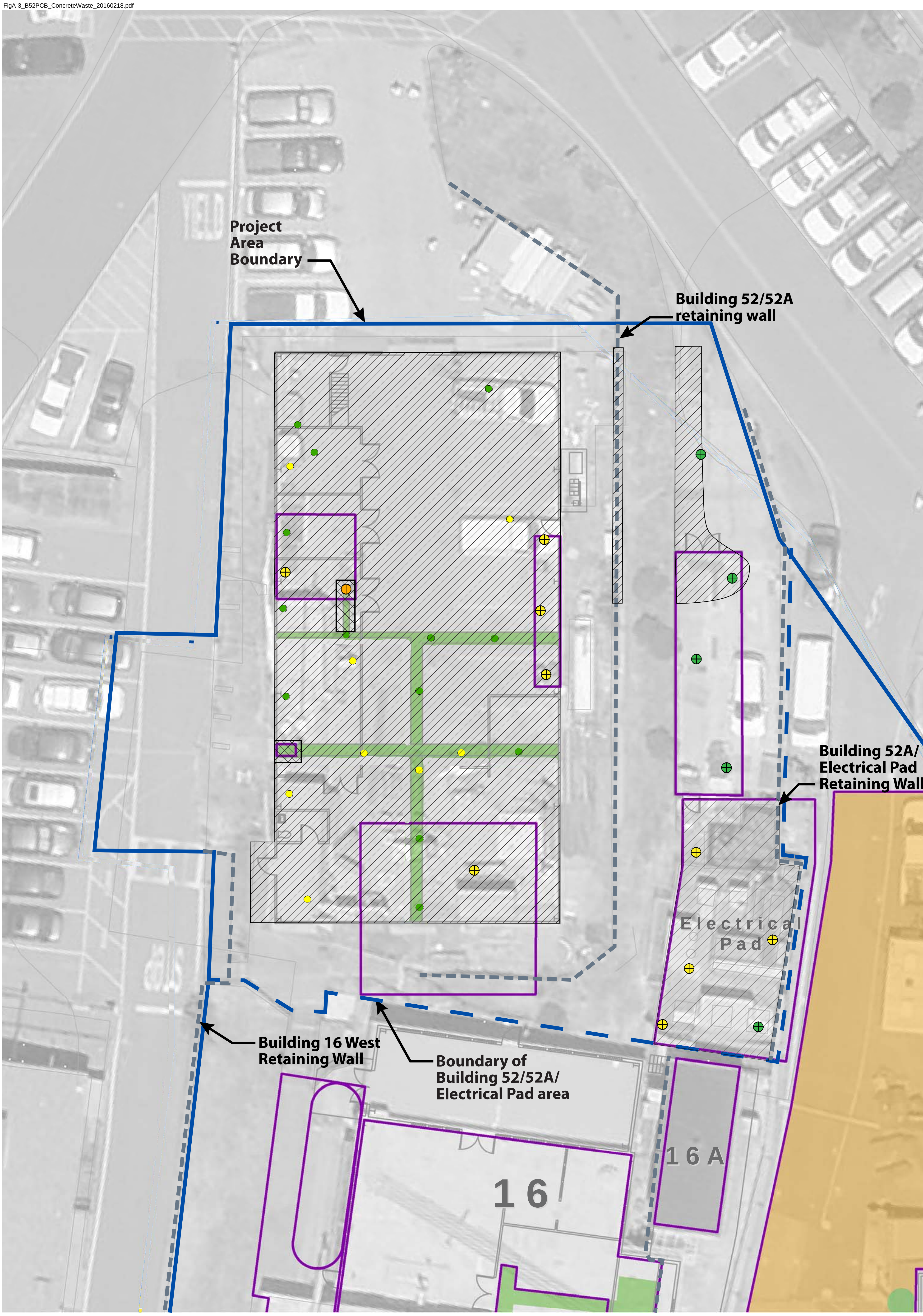
0 8 16
Scale in Feet

N

Figure A-2
Total PCB Concentrations in Soil Buildings 52, 52A, and the Electrical Pad

Dynamic Management Solutions, LLC
LBNL Old Town

FigA-3_B52PCB_ConcreteWaste_20160218.pdf



EXPLANATION

- Project Area
- Area of PCB Use
- Pit/Trench/Vault
- Building 5 Radiological Waste Processing Yard

Total PCB Concentration in Concrete

- $\leq$ 0.94 mg/kg
- > 0.94 mg/kg
- > 50 mg/kg

- Pre-2015 concrete sample location.
- 2015 concrete sample location.
- Concrete slab to be disposed of as PCB remediation waste $\geq$ 50 mg/kg total PCBs
- Concrete slab to be disposed of as PCB remediation waste < 50 mg/kg total PCBs

All concrete other than indicated above may be disposed of at a Class III disposal facility.

0 8 16
Scale in Feet

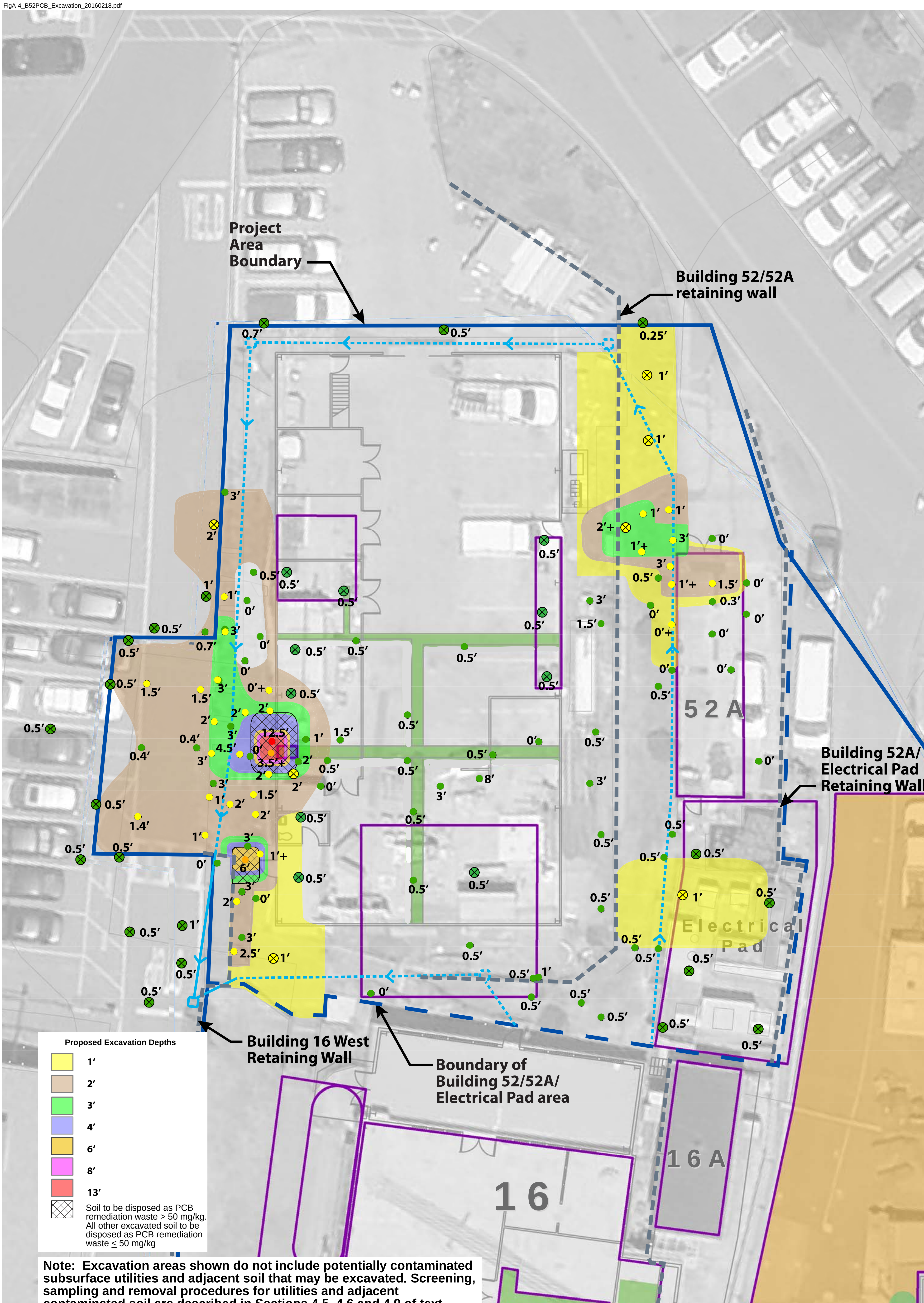
NOTE:
1. Trenches in Building 52 have been removed and backfilled with concrete.
2. Aerial Imagery © 2014 Pictometry

Figure A-3
Proposed Concrete Disposition Plan Buildings 52, 52A, and the Electrical Pad

Old Town Demolition Project Phase I

Dynamic Management Solutions, LLC
LBNL Old Town

FigA-4_B52PCB_Excavation_20160218.pdf



EXPLANATION

- Project Area
- Area of PCB Use
- Pit/Trench/Vault
- Building 5 Radiological Waste Processing Yard
- Storm sewers and catchbasins showing direction of flow. Dashed segments to be demolished during Phase I

Maximum Total PCB Concentration Detected in Soil Boring

- ≤ 0.94 mg/kg
- > 0.94 mg/kg
- > 50 mg/kg
- > 500 mg/kg

○ Pre-2015 soil boring location.

⊗ 2015 soil boring location.

0.5′ Depth in feet of shallowest sample in boring containing no samples with total PCB concentrations exceeding 0.94 mg/kg.

0.5′ Depth in feet of shallowest "clean" (≤ 0.94 mg/kg total PCBs) sample beneath PCB-contaminated soil. Note that collocated borings are treated as a single boring.

2′+ Maximum depth of PCBs > 0.94 mg/kg not determined because all samples in boring exceeded 0.94 mg/kg. Value shows depth in feet of deepest sample in boring.

0 8 16

Scale in Feet

NOTE:
1. Trenches in Building 52 have been removed and backfilled with concrete.
2. Aerial Imagery © 2014 Pictometry

Figure A-4
Proposed Excavation Plan Buildings 52, 52A, and the Electrical Pad

Old Town Demolition Project Phase I

Dynamic Management Solutions, LLC
LBNL Old Town

Appendix B. Summary Tables of PCB Analytical Results

Summary of PCB Concentration Ranges in Above Slab Building Materials, Old Town Demolition Project.

Table B-1 Summary of PCB Concentrations in Concrete and Sediment at Building 52. 52A and the Electrical Pad.

Table B-2 Soil Sampling Results from Old Town Demolition Project, Buildings 52, 52A, Electrical Pad Area–Polychlorinated Biphenyls

SUMMARY OF PCB CONCENTRATION RANGES IN ABOVE-SLAB BUILDING MATERIALS, OLD TOWN DEMOLITION PROJECT, PHASE I

A summary characterization of building materials for buildings 5, 16, and 16A is presented below.

Building 5

In 2010, a pre-demolition reconnaissance-level characterization was conducted at Building 5 (Weiss Associates, 2010). A total of 22 samples was collected for PCB analysis of various building matrices. Samples by matrix and total PCB results are listed below:

2010 Building Materials Sampling Summary – Building 5

Matrix	Total No. of Samples	No. of Samples with PCBs Detected	Concentration Range of Total PCBs Detected (mg/kg)
Caulk	1	1	0.42
Concrete Slab Floor	16 (includes 1 duplicate)	1	0.007
Concrete Wall	2	2	0.1
Paint (Interior)	3	3	2.3 to 19.9

Notes:
mg/kg milligrams per kilogram
PCB polychlorinated biphenyl

In 2013, Northgate Environmental Management, Inc. inspected equipment for oil and collected one oil sample from equipment (no. 33) for analysis of PCBs. PCBs were not detected above the reporting limit of 2 mg/kg in the oil sample (Northgate Environmental Management, 2014).

In 2015, supplemental sampling of select building materials and equipment was conducted to fill data gaps from the previous characterizations per the *Sampling and Analysis Plan for PCBs – Above Slab Building Characterization Old Town Phase I Demolitions* (DMS, 2015).

An inventory was completed to determine potential PCB containing media in building materials and equipment. Media not previously characterized were sampled during this characterization effort. A total of 125 samples was collected and analyzed for PCBs. Samples by matrix and total PCB results are listed below.

2015 Building Materials Sampling Summary – Building 5

Matrix	Total No. of Samples	No. of Samples with PCBs Detected	Concentration Range of Total PCBs Detected (mg/kg)
Cable	5	3	1.2 to 8
Caulk	18	12	0.079 to 3.7
Caulk Substrate[1]	2	2	0.61 to 0.99
Ceiling Tile	6	6	1.4 to 10
Concrete	1	1	0.041
Dry Wall Tape	**5**	**5**	**0.31 to 360**
Mastic	14	5	0.18 to 3.3
Oil	15	0	Not Applicable

Matrix	Total No. of Samples	No. of Samples with PCBs Detected	Concentration Range of Total PCBs Detected (mg/kg)
Paint (Interior/Exterior)	22	22	0.18 to 11
Paper/Vapor Barrier	3	3	6.2 to 13
Roof Material	3	3	1 to 1.5
Transite	3	3	0.2 to 12
Wipes (porous matrices)	28	7	0.41 to 1.4 $\mu g/100cm^2$

Notes:
$\mu g/100cm^2$ micrograms per 100 square centimeter
mg/kg milligrams per kilogram
PCB polychlorinated biphenyl
Bold-face type detections with result(s) greater than 50 mg/kg

Based on the building materials data collected at Building 5, the only PCB bulk product waste encountered was drwall tape located in room 150. Subsequent sampling showed that only the tape contained PCBs greater than 50 mg/kg and that it had not leached into the drywall. The drywall tape in Room 150 was disposed of as PCB radioactive waste at the Nevada National Security Site as indicated in a letter provided to EPA on October 12, 2015 (LBNLb).

Records of material disposal for Building 5 are retained at LBNL as described in Section **Error! Reference source not found.**.

Buildings 16 and 16A

In 2013, a reconnaissance-level characterization was conducted at Buildings 16 and 16A (Northgate, 2014). A total of 29 samples were collected for PCB analysis of various media in building materials and equipment. Samples by matrix and total PCB results are listed below:

2013 Building Materials Sampling Summary – Buildings 16 and 16A

Matrix	Total No. of Samples	No. of Samples with PCBs Detected	Concentration Range of Total PCBs Detected (mg/kg)
Caulk	11 (includes 1 duplicate)	6	0.052 to 0.67
Oil	11 (includes 1 duplicate)	4	2.8 to 31
Paint (exterior)	1	1	0.26
Sediment (equipment)	1	0	Not Applicable
Wipe (porous matrices)	5	3	0.88 to 5.4

Notes:
$\mu g/100cm^2$ micrograms per 100 square centimeter
mg/kg milligrams per kilogram

In 2015, supplemental sampling of select building materials and equipment was conducted to fill data gaps from the previous characterization efforts (DMS, 2015b). An inventory was conducted to determine potential PCB-containing media in the building materials and equipment. Previously uncharacterized media were sampled. A total of 171 samples was collected and analyzed for PCBs. Samples by matrix and total PCB results are listed below.

2015 Building Materials Sampling Summary – Buildings 16 and 16A

Matrix	Total No. of Samples	No. of Samples with PCBs Detected	Concentration Range of Total PCBs Detected (mg/kg)
Cable	4	4	1.4 to 6.3
Caulk	28	21	0.33 to 39
Caulk Substrate[1]	2	2	0.066 to 4.4
Ceiling Tile	4	2	0.15 to 0.25
Dry Wall Tape	**9**	**7**	**2.5 to 56**
Cooling Liquid/Water	4	0	Not Applicable
Mastic	**8**	**7**	**3.6 to 170**
Oil	12	2	1.6 to 6.3
Paint (Interior/Exterior)	37	35	0.084 to 74
Particle Board/Insulation	**6**	**4**	**1.7 to 380**
Roof Material	24	9	0.35 to 4.5
Transite	18	12	0.077 to 2.8
Wipes (porous matrices)	**15**	**11**	**0.26 to 38**

Notes:

μg/100 cm^2	micrograms per 100 square centimeter
mg/kg	milligrams per kilogram
PCB	polychlorinated biphenyl
Bold-face type	detections with result(s) greater than 50 mg/kg

Based on the building materials data collected at Buildings 16 and 16A, the following PCB bulk product waste was encountered: mastic, red paint, white paint and tape in limited areas of Building 16 and insulation from one wall of Building 16A. These materials were all segregated from other building materials and disposed of as California hazardous waste at Waste Management, Inc.'s facility in Kettleman Hills, California, with the exception of the red paint which was disposed at a facility in Arlington, Oregon. Wipe samples collected from a fume hood in Building 16 exceeded the regulatory standard of 10 mg/kg over 10cm^2. The fume hood was subsequently characterized as PCB remediation waste and disposed of in accordance with 761.61(b) at a waste disposal facility in Arlington, Oregon. Disposal of these wastes has been described in letters provided to EPA on January 6, 2016 and November 18, 2015. (LBNL 2016 and LBNL 2015a).

Records of material disposal for Building 5 are retained at LBNL as described in Section **Error! Reference source not found.**

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Table B-2
Soil Sampling Results from Old Town Demolition Project
Buildings 52/52A/Electrical Pad Area - Polychlorinated Biphenyls
(concentrations in mg/kg)

					PCBs-8082**				
					Aroclor-1242	**Aroclor-1254**	**Aroclor-1260**	**Aroclor-1268**	**Total PCBs**
				Screening Level*					0.94
Location	Sample ID	Depth (ft)	Lab	Date					
SB-52-95-1	BS-SB-95-1-3	3.0	BC	6/27/95	<0.01	<0.01	<0.01		ND
	BS-SB-95-1-6	6.0	BC	6/27/95	<0.01	<0.01	<0.01		ND
SB-52-95-2	BS-SB-95-2-3	3.0	BC	6/27/95	<0.01	<0.01	0.16		0.16
	BS-SB-95-2-6	6.0	BC	6/27/95	<0.01	<0.01	<0.01		ND
SB52-96-1	BS-SB-96-1-1	1.0	BC	7/22/96	<0.01	<0.01	<0.01		ND
	BS-SB-96-1-5	5.0	BC	7/22/96	<0.01	<0.01	<0.01		ND
SB52-96-10	BS-SB-96-10-0.5	0.5	BC	8/9/96	<0.05	0.43	<0.05		0.43
	BS-SB-96-10-5	5.0	BC	8/26/96	<0.01	<0.01	<0.01		ND
SB52-96-2	BS-SB-96-2-0.5	0.5	BC	7/22/96	<0.01	<0.01	0.02		0.02
	BS-SB-96-2-5	5.0	BC	7/22/96	<0.01	<0.01	<0.01		ND
SB52-96-3	BS-SB-96-3-0.5	0.5	BC	7/22/96	<0.02	<0.02	0.16		0.16
	BS-SB-96-3-5	5.0	BC	7/22/96	<0.01	<0.01	<0.01		ND
SB52-96-4	BS-SB-96-4-0.5	0.5	BC	7/22/96	<0.02	<0.02	0.19		0.19
	BS-SB-96-4-5	5.0	BC	7/22/96	<0.01	<0.01	0.14		0.14
SB52-96-5	BS-SB-96-5-1.5	1,5	BC	7/22/96	<0.01	<0.01	0.02		0.02
SB52-96-6	BS-SB-96-6-0.5	0.5	BC	8/9/96	<0.02	0.12	<0.02		0.12
	BS-SB-96-6-5	5.0	BC	8/26/96	<0.01	<0.01	<0.01		ND
SB52-96-7	BS-SB-96-7-0.5	0.5	BC	8/9/96	<0.02	0.14	<0.02		0.14
SB52-96-8	BS-SB-96-8-0.5	0.5	BC	8/9/96	<0.01	<0.01	<0.01		ND
	BS-SB-96-8-5	5.0	BC	8/26/96	<0.01	<0.01	<0.01		ND
SB52-96-9	BS-SB-96-9-0.5	0.5	BC	8/9/96	<0.01	0.029	<0.01		0.029
	BS-SB-96-9-5	5.0	BC	8/26/96	<0.01	<0.01	<0.01		ND
SB52-97-1	BS-SB-97-1-0.5	0.5	BC	3/21/97	<0.2	1.3	<0.2		**1.3**
	BS-SB-97-1-1.5	1.5	BC	3/21/97	<0.05	0.31	<0.05		0.31
	BS-SB-97-1-4.8	4.8	BC	3/21/97	<0.01	<0.01	<0.01		ND
SB52-97-2	BS-SB-97-2-0.5	0.5	BC	3/21/97	<0.01	0.018	<0.01		0.018
	BS-SB-97-2-1.5	1.5	BC	3/21/97	<0.01	0.023	<0.01		0.023
	BS-SB-97-2-5	5.0	BC	3/21/97	<0.05	0.22	<0.05		0.22
SS52-10-1		3.0	BC	6/11/10	<0.2	<0.2	<0.2		ND
		4.0	BC	6/11/10	<0.2	<0.2	<0.2		ND
SS52-10-3		3.0	BC	6/11/10	<0.2	<0.2	<0.2		ND
		5.0	BC	6/11/10	<0.2	<0.2	<0.2		ND
SS52-10-4		3.0	BC	6/11/10	<0.2	<0.2	<0.2		ND
		5.0	BC	6/11/10	<0.2	<0.2	<0.2		ND
SS52-10-5		3.0	BC	6/14/10	<0.2	<0.2	<0.2		ND
		5.0	BC	6/14/10	<0.2	<0.2	<0.2		ND
SS52-10-6		3.0	BC	6/11/10	<0.2	<0.2	<0.2		ND
		5.0	BC	6/11/10	<0.2	<0.2	<0.2		ND
SS52-10-7		3.0	BC	6/14/10	<0.2	<0.2	<0.2		ND
		5.0	BC	6/14/10	<0.2	<0.2	<0.2		ND
SS52-10-8		3.0	BC	6/14/10	<0.2	<0.2	<0.2		ND
		5.0	BC	6/14/10	<0.2	<0.2	<0.2		ND
SS52-10-9		3.0	BC	6/14/10	<0.2	<0.2	<0.2		ND
		5.0	BC	6/14/10	<0.2	<0.2	<0.2		ND
SS52-11-1		0.5	CT	9/16/11	<1	<1	<1		ND
		3.0	CT	9/16/11	<1	<1	<1		ND

Table B-1 Summary of PCB Concentrations in Concrete and Sediment at Buildings 52 and 52A and at the Electrical Pad

Sample Number	Location	Sample collection timeframe	Total PCBs (mg/kg)
CONCRETE			
B52SC01	Building 52, Room 100 NE	Summer 2010	0.09
B52SC02	Building 52, Room 100 NE	Summer 2010	0.47
B52SC03 dup	Building 52, Room 100 NE	Summer 2010	**7**
B52SC011	Building 52, Room 100 SW	Summer 2010	**1.2**
B52SC012	Building 52, Room 100 SW	Summer 2010	**20**
B52SC013	Building 52, Room 111 E	Summer 2010	**4.2**
B52SC014	Building 52, Room 111 NW	Summer 2010	<0.033
B52SC015	Building 52, Room 111 W	Summer 2010	0.0071
B52SC016	Building 52, Room 111 W	Summer 2010	0.33
B52SC017 dup	Building 52, Room 109 W	Summer 2010	0.075
B52SC018	Building 52, Room 107 SW	Summer 2010	**1.05**
B52SC019	Building 52, Room 107 Center	Summer 2010	0.2
B52SC020	Building 52, Room 103 S	Summer 2010	0.25
B52-SC-001	Building 52, east side, center	December 2015	**1.2**
CS52-11-1	Building 52 floor trench	September 13 2011	<1.0
CS52-11-2	Building 52 floor trench	September 13 2011	<1.0
CS52-11-3	Building 52 floor trench	September 13 2011	**10.4**
CS52-11-4	Building 52 floor trench	September 13 2011	<1.0
CS52-11-5	Building 52 floor trench	September 13 2011	**3.9**
CS52-11-6	Building 52 floor trench	September 13 2011	**3.5**
CS52-11-7	Building 52 floor trench	September 13 2011	<1.0
CS52-11-8	Building 52 floor trench	September 13 2011	<1.0
CS52-11-9	Building 52 floor trench	September 13 2011	<1.0
CS52-11-10	Building 52 floor trench	September 13 2011	<1.0
B52-SC-002	Building 52, east side, center	December 2015	**7.5**
B52-SC-003	Building 52, east side, center	December 2015	**7.4, 6.5** (dup)
B52-SC-004	Building 52, Room 109 SW	December 2015	**1.4**
B52-SC-005	Building 52, Room 109 SE	December 2015	**70**
B52-SC-006	Building 52, SE	December 2015	**20**
B52-SC-008	Walkway north of Building 52A	December 2015	<0.069
B52-SC-009	Building 52A NE	December 2015	0.07
B52-SC-010	Building 52A S	December 2015	0.27
B52-SC-011	Building 52A center	December 2015	<0.71
B16-SC-57	Electrical Pad SE	December 2015	0.12
B16-SC-58	Electrical Pad SW S center	December 2015	**1.6**
B16-SC-50	Electrical Pad NW	December 2015	**5.3**
B16-SC-65	Electrical Pad	December 2015	**2.2**
SEDIMENT			
B52-SE-001	Building 52A northeast corner	December 2015	**2.7**
B52-SE-002	Building 52A center	December 2015	**4.1**
B16-SE-011	Electrical Pad southwest corner	December 2015	**32**
B16-SE-012	Electrical Pad southwest	December 2015	**2.6**
B16-SE-015	Electrical Pad northwest	December 2015	**1.4**
B16-SE-018	Electrical Pad center east side	December 2015	**13**
B16-SE-019	Electrical Pad center west side	December 2015	**46**

Acronyms and Abbreviations:

dup	duplicate	PCB	polychlorinated biphenyl
mg/kg	milligrams per kilogram	S	south
E	east	SE	south east
N	north	SW	south west
NE	north east	W	west
NW	north west		

Values in bold type exceed the cleanup goal of 0.94 mg/kg.

Shaded values exceed 50 mg/kg

Table B-2 (Cont'd)
Soil Sampling Results from Old Town Demolition Project
Buildings 52/52A/Electrical Pad Area - Polychlorinated Biphenyls
(concentrations in mg/kg)

					PCBs-8082**				
					Aroclor-1242	Aroclor-1254	Aroclor-1260	Aroclor-1268	Total PCBs
				Screening Level*					0.97
Location	Sample ID	Depth (ft)	Lab	Date					
SS52-11-2		0.5	CT	9/15/11	<1	<1	<1		ND
		3.0	CT	9/15/11	<1	<1	<1		ND
SS52-11-3		0.5	CT	9/15/11	<1	<1	<1		ND
		3.0	CT	9/15/11	<1	<1	<1		ND
SS52-11-4		0.5	CT	9/16/11	<1	<1	<1		ND
		3.0	CT	9/16/11	<1	<1	<1		ND
SS52-11-5		0.5	CT	9/15/11	<1	<1	<1		ND
		3.0	CT	9/15/11	<1	<1	<1		ND
SS52-11-6		0.5	CT	9/15/11	<1	<1	<1		ND
SS52-11-7		0.5	CT	9/15/11	<1	<1	<1		ND
		3.0	CT	9/15/11	<1	<1	<1		ND
SS52-11-8		0.5	CT	9/15/11	<1	<1	<1		ND
		3.0	CT	9/15/11	<1	<1	<1		ND
SS52-11-9		0.5	CT	9/28/11	<1	<1	<1		ND
SS52-11-10		0.5	CT	9/28/11	<1	<1	<1		ND
SS52-14-8	SS52-14-8-0'	0.0	CT	3/5/14	<0.012	0.11	0.013		0.123
	SS52-14-8-1'	1.0	CT	3/5/14	<0.0095	0.05	<0.0095		0.05
SB52-14-8	SB52-14-8-5'	5.0	CT	5/21/14	<0.0093	<0.0093	<0.0093	<0.0093	ND
	SB52-14-8-6'	6.0	CT	5/21/14	<0.0098	<0.0098	<0.0098	<0.0098	ND
	SB52-14-8-10'	10.0	CT	5/21/14	<0.0097	<0.0097	<0.0097	<0.0097	ND
	SB52-14-8-15'	15.0	CT	5/21/14	<0.0097	<0.0097	<0.0097	<0.0097	ND
SB52-14-9A	SB52-14-9A-8'	8.0	CT	5/7/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-9A-10'	10.0	CT	5/7/14	<0.012	<0.012	<0.012	<0.012	ND
SB52-14-9B	SB52-14-9B-3'	3.0	CT	5/21/14	<0.0095	<0.0095	<0.0095	<0.0095	ND
	SB52-14-9B-6'	6.0	CT	5/21/14	<0.0098	<0.0098	<0.0098	<0.0098	ND
	SB52-14-9B-8'	8.0	CT	5/7/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-9B-9'	9.0	CT	5/21/14	<0.0097	<0.0097	<0.0097	<0.0097	ND
	SB52-14-9B-10'	10.0	CT	5/7/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-9B-12'	12.0	CT	5/21/14	<0.0098	<0.0098	<0.0098	<0.0098	ND
SB52-14-10	SB52-14-10-2'	0.0	CT	3/5/14	<0.012	<0.012	<0.012		ND
	SB52-14-10-3'	1.0	CT	3/5/14	<0.012	<0.012	<0.012		ND
SS52-14-11	SS52-14-11-0.5	0.5	CT	3/3/14	<0.012	<0.012	0.016		0.016
	SS52-14-11-1.5	1.5	CT	3/3/14	<0.012	<0.012	<0.012		ND
SS52-14-12	SS52-14-12-0.5	0.5	CT	3/3/14	<0.012	<0.012	0.012		0.012
SB52-14-20	SB52-14-20-3"	0.0	CT	5/9/14	<0.17	8.8	<0.17	<0.17	**8.8**
	SB52-14-20-1'	1.0	CT	5/9/14	<17	660	<17	<17	**660**
	SB52-14-20-3'	3.0	CT	5/9/14	<17	690	<17	<17	**690**
	SB52-14-20-5'	5.0	CT	4/7/14	<1.3	250	16		**266**
	SB52-14-20-6'	6.0	CT	4/7/14	<1.3	300	16		**316**
	SB52-14-20-8'	8.0	CT	5/9/14	<17	840	<17	<17	**840**
	SB52-14-20-10'	10.0	CT	5/9/14	<1.7	11	<1.7	<1.7	**11**
	SB52-14-20-12'	12.0	CT	5/9/14	<0.84	14	<0.84	<0.84	**14**
	SB52-14-20-12.5'	12.5	CT	5/20/14	<0.0098	<0.0098	<0.0098	<0.0098	ND
	SB52-14-20-15'	15.0	CT	5/20/14	<0.0097	<0.0097	<0.0097	<0.0097	ND
	SB52-14-20-20'	20.0	CT	5/20/14	<0.0098	<0.0098	<0.0098	<0.0098	ND
	SB52-14-20-24'	24.0	CT	5/20/14	<0.0095	<0.0095	<0.0095	<0.0095	ND

Table B-2 (Cont'd)
Soil Sampling Results from Old Town Demolition Project
Buildings 52/52A/Electrical Pad Area - Polychlorinated Biphenyls
(concentrations in mg/kg)

					PCBs-8082**				
					Aroclor-1242	**Aroclor-1254**	**Aroclor-1260**	**Aroclor-1268**	**Total PCBs**
				Screening Level*					0.97
Location	Sample ID	Depth (ft)	Lab	Date					
SB52-14-22	SB52-14-22-1.5'	1.5	CT	5/21/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-22-4'-8'	4.0	CT	5/21/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-22-8'-12'	8.0	CT	5/21/14	<0.0099	0.032	<0.0099	<0.0099	0.032
SB52-14-24	SB52-14-24-2'	2.0	CT	5/21/14	0.19	<0.012	<0.012	<0.012	0.19
	SB52-14-24-5'	5.0	CT	5/21/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-24-10'	10.0	CT	5/21/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-24-16'	16.0	CT	5/21/14	<0.012	<0.012	<0.012	<0.012	ND
SB52-14-25	SB52-14-25-1'	1.0	CT	5/20/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-25-5'	5.0	CT	5/20/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-25-10'	10.0	CT	5/20/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-25-13'	13.0	CT	5/20/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-25-15.5'	15.5	CT	5/20/14	<0.012	<0.012	<0.012	<0.012	ND
SB52-14-26	SB52-14-26-3"	0.3	CT	5/9/14	<0.42	4.9	<0.42	<0.42	**4.9**
	SB52-14-26-1'	1.0	CT	5/9/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-26-3'	3.0	CT	5/9/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-26-6'	6.0	CT	5/9/14	<0.012	<0.012	<0.012	<0.012	ND
SB52-14-27	SB52-14-27-0.25'	0.0	CT	5/21/14	<0.041	1.2	<0.041	<0.041	**1.2**
	SB52-14-27-2'	2.0	CT	5/21/14	<0.012	0.037	<0.012	<0.012	0.037
	SB52-14-27-5'	5.0	CT	5/21/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-27-10'	10.0	CT	5/21/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-27-15'	15.0	CT	5/21/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-27-20'	20.0	CT	5/21/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-27-24'	24.0	CT	5/21/14	<0.012	<0.012	<0.012	<0.012	ND
SB52-14-28	SB52-14-28-3"	0.0	CT	5/9/14	<0.012	0.19	<0.012	<0.012	0.19
	SB52-14-28-1'	1.0	CT	5/9/14	<0.012	0.052	<0.012	<0.012	0.052
	SB52-14-28-3'	4.0	CT	5/9/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-28-6'	6.0	CT	5/9/14	<0.012	<0.012	<0.012	<0.012	ND
	SB52-14-28-9'	9.0	CT	5/9/14	<0.012	0.45	<0.012	<0.012	0.45
SB52-14-29	SB52-14-29-3.5'	3.5	CT	5/14/14	<83	170	<83	<83	**170**
SB52-14-30	SB52-14-30-1.5'	1.5	CT	5/14/14	<0.041	1.1	<0.041	<0.041	**1.1**
	SB52-14-30-4.5'	4.5	CT	5/14/14	<0.083	0.82	<0.083	<0.083	0.82
SB52-14-31	SB52-14-31-2'	2.0	CT	5/14/14	<0.083	2.2	<0.083	<0.083	**2.2**
	SB52-14-31-3'	3.0	CT	6/13/14	<0.0095	0.36	<0.0095	<0.0095	0.36
SS52-14-32	SS52-14-32-0.25'	0.0	CT	5/16/14	<0.012	0.17	<0.012	<0.012	0.17
SS52-14-33	SS52-14-33-0.25'	0.0	CT	5/16/14	<0.085	0.85	0.24	<0.085	**1.09**
SB52-14-34	SB52-14-34-0.25'	0.0	CT	5/16/14	<0.83	35	<0.83	<0.83	**35**
	SB52-14-34-1'	1.0	CT	6/13/14	<0.066	3.9	0.5	<0.066	**4.4**
	SB52-14-34-2'	2.0	CT	7/21/14	<0.0097	0.24	<0.0097	<0.0097	0.24
SB52-14-35	SB52-14-35-0.25'	0.0	CT	5/21/14	<0.041	2.0	<0.041	<0.041	**2.0**
	SB52-14-35-2'	2.0	CT	5/21/14	<0.0096	<0.0096	0.0091[J]	<0.0096	0.0091[J]
	SB52-14-35-5'	5.0	CT	5/21/14	<0.0098	<0.0098	<0.0098	<0.0098	ND
	SB52-14-35-10'	10.0	CT	5/21/14	<0.0099	<0.0099	<0.0099	<0.0099	ND
	SB52-14-35-15'	15.0	CT	5/21/14	<0.0099	<0.0099	<0.0099	<0.0099	ND
SB52-14-36	SB52-14-36-0.25'	0.0	CT	5/21/14	<0.34	12	<0.34	<0.34	**12**
	SB52-14-36-1'	1.0	CT	5/21/14	<0.33	14	<0.33	<0.33	**14**
	SB52-14-36-2'	2.0	CT	6/13/14	<0.0095	<0.0095	<0.0095	<0.0095	ND

Table B-2 (Cont'd)
Soil Sampling Results from Old Town Demolition Project
Buildings 52/52A/Electrical Pad Area - Polychlorinated Biphenyls
(concentrations in mg/kg)

					PCBs-8082**				
					Aroclor-1242	**Aroclor-1254**	**Aroclor-1260**	**Aroclor-1268**	**Total PCBs**
				Screening Level*					0.97
Location	Sample ID	Depth (ft)	Lab	Date					
SB52-14-37	SB52-14-37-0.25'	0.0	CT	6/16/14	<0.066	3.3	0.58	<0.066	**3.88**
	SB52-14-37-1'	1.0	CT	6/16/14	<0.067	2.0	0.42	<0.067	**2.42**
	SB52-14-37-2'	2.0	CT	6/16/14	<0.0096	<0.0096	<0.0096	<0.0096	ND
SB52-14-38	SB52-14-38-0.25'	0.0	CT	6/16/14	<0.33	9.2	<0.33	<0.33	**9.2**
	SB52-14-38-1'	1.0	CT	6/16/14	<0.033	0.54	0.23	<0.033	0.77
	SB52-14-38-2'	2.0	CT	6/16/14	<0.0096	0.074	<0.0096	<0.0096	0.074
SS52-14-40	SS52-14-40-0.25'	0.0	CT	6/13/14	<0.033	0.63	0.17	<0.033	0.8
	SS52-14-40-1'	1.0	CT	6/13/14	<0.0096	0.2	0.011	<0.0096	0.211
SB52-14-41	SB52-14-41-0.25'	0.0	CT	6/13/14	<0.065	3.6	0.53	<0.065	**4.13**
	SB52-14-41-1'	1.0	CT	6/13/14	<0.065	3.5	0.67	<0.065	**4.17**
SS52-14-42	SS52-14-42-0.25'	0.0	CT	6/13/14	<0.33	6.1	1.1	<0.33	**7.2**
	SS52-14-42-1'	1.0	CT	6/13/14	<0.33	0.69	0.15	<0.33	0.84
SB52-14-43	SB52-14-43-0.25'	0.0	CT	6/13/14	<1.3	110	12	<1.3	**122**
	SB52-14-43-1'	1.0	CT	7/7/14	<0.066	6.1	0.66	<0.066	**6.76**
	SB52-14-43-3'	3.0	CT	7/7/14	<0.066	4.0	0.44	<0.066	**4.44**
	SB52-14-43-6'	6.0	CT	7/7/14	<0.0095	0.062	<0.0095	<0.0095	0.062
SB52-14-44	SB52-14-44-3"	0.0	CT	7/7/14	<0.068	1.5	0.36	<0.068	**1.86**
SB52-14-45	SB52-14-45-3"	0.0	CT	7/7/14	<0.34	21	4.0	<0.34	**25**
	SB52-14-45-1'	1.0	CT	7/7/14	<1.3	23	3.3	<1.3	**26.3**
	SB52-14-45-2'	2.0	CT	7/21/14	<0.0098	0.62	<0.0098	<0.0098	0.62
SB52-14-46	SB52-14-46-3"	0.0	CT	7/7/14	<0.069	2.9	0.73	<0.069	**3.63**
	SB52-14-46-1'	1.0	CT	7/7/14	<0.067	4.2	1.2	<0.067	**5.4**
	SB52-14-46-2.5'	2.5	CT	7/21/14	<0.0096	0.07	<0.0096	<0.0096	0.07
SB52-14-47	SB52-14-47-0'	0.0	CT	7/18/14	<0.034	0.17	0.089	<0.034	0.259
	SB52-14-47-1'	1.0	CT	7/18/14	<0.0096	0.013	0.015	<0.0096	0.028
SB52-14-48	SB52-14-48-0'	0.0	CT	7/18/14	<0.034	1.3	0.31	<0.034	**1.61**
	SB52-14-48-1'	1.0	CT	7/18/14	<0.033	0.39	0.23	<0.033	0.62
SB52-14-49	SB52-14-49-0.5'	0.5	CT	7/30/14	<0.033	0.26	1.0	<0.033	**1.26**
	SB52-14-49-1.5'	1.5	CT	7/30/14	<0.0096	<0.0096	<0.0096	<0.0096	ND
SB52-14-50	SB52-14-50-0.4'	0.0	CT	7/30/14	<0.0094	<0.0094	0.45	<0.0094	0.45
	SB52-14-50-1.4'	1.4	CT	7/30/14	<0.0095	<0.0095	<0.0095	<0.0095	ND
SB52-14-52	SB52-14-52-0.7'	0.7	CT	7/30/14	<0.0094	<0.0094	0.11	<0.0094	0.11
SB52-14-53	SB52-14-53-0.5'	0.5	CT	7/30/14	<0.033	<0.033	2.0	<0.033	**2.0**
	SB52-14-53-1.5'	1.5	CT	7/30/14	<0.0095	<0.0095	<0.0095	<0.0095	ND
SB52-14-54	SB52-14-54-0.4'	0.0	CT	7/30/14	<0.0095	<0.0095	0.24	<0.0095	0.24
	SB52-14-54-1'	1.0	CT	7/30/14	<0.0093	<0.0093	0.022	<0.0093	0.022
SB52-14-55	SB52-14-55-0.4'	0.4	CT	7/30/14	<1.3	<1.3	45	<1.3	**45**
	SB52-14-55-1.4'	1.4	CT	7/30/14	<0.0094	<0.0094	<0.0094	<0.0094	ND
SB52-14-56	SB52-14-56-1'	1.0	CT	7/30/14	<0.0094	0.066	0.074	<0.0094	0.14
	SB52-14-56-1.9'	1.9	CT	7/30/14	<0.0095	<0.0095	0.035	<0.0095	0.035
	SB52-14-56-3.9'	3.9	CT	7/30/14	<0.0099	<0.0099	<0.0099	<0.0099	ND
SB52-14-57	SB52-14-57-3"	0.0	CT	7/21/14	<0.0095	<0.0095	<0.0095	<0.0095	ND
	SB52-14-57-1'	1.0	CT	7/21/14	<0.0098	<0.0098	0.011	<0.0098	0.011
	SB52-14-57-3'	3.0	CT	7/21/14	<0.0098	<0.0098	<0.0098	<0.0098	ND
SB52-14-58	SB52-14-58-3"	0.0	CT	7/21/14	<0.034	6.6	0.35	<0.034	**6.95**
	SB52-14-58-1'	1.0	CT	7/21/14	<0.066	5.2	0.62	<0.066	**5.82**

Table B-2 (Cont'd)
Soil Sampling Results from Old Town Demolition Project
Buildings 52/52A/Electrical Pad Area - Polychlorinated Biphenyls
(concentrations in mg/kg)

					PCBs-8082**				
					Aroclor-1242	**Aroclor-1254**	**Aroclor-1260**	**Aroclor-1268**	**Total PCBs**
				Screening Level*					1.0
Location	Sample ID	Depth (ft)	Lab	Date					
SB52-14-59	SB52-14-59-3"	0.0	CT	7/21/14	<0.0097	<0.0097	<0.0097	<0.0097	ND
	SB52-14-59-1'	1.0	CT	7/21/14	<0.0095	<0.0095	<0.0095	<0.0095	ND
SB52-14-60	SB52-14-60-3"	0.0	CT	7/21/14	<0.033	2.4	0.57	<0.033	**2.97**
	SB52-14-60-1'	1.0	CT	7/21/14	<0.0094	0.017	0.013	<0.0094	0.03
	SB52-14-60-3'	3.0	CT	7/21/14	<0.0098	<0.0098	<0.0098	<0.0098	ND
SB52-14-61	SB52-14-61-3"	0.0	CT	7/21/14	<0.0099	0.55	0.34	<0.0099	0.89
	SB52-14-61-1'	1.0	CT	7/21/14	<0.065	5.2	1.5	<0.065	**6.7**
	SB52-14-61-3'	3.0	CT	7/21/14	<0.0093	<0.0093	<0.0093	<0.0093	ND
SB52-14-62	SB52-14-62-0.4'	0.4	CT	7/30/14	<0.013	<0.013	<0.013	<0.013	ND
	SB52-14-62-1.4'	1.4	CT	7/30/14	<0.0095	<0.0095	<0.0095	<0.0095	ND
B52-SD-001	B52-SD-001-0.5'	0.5	CT	12/7/15	<0.088	<0.088	<0.088	<0.088	ND
	B52-SD-001-1'	1.0	CT	12/8/15	<0.088	<0.088	<0.088	<0.088	ND
B52-SD-002	B52-SD-002-0.5'	0.5	CT	12/8/15	<0.087	<0.087	<0.087	<0.087	ND
	(D)	0.5	CT	12/8/15	<0.088	<0.088	<0.088	<0.088	ND
	B52-SD-002-1'	1.0	CT	12/8/15	<0.012	0.039	<0.012	<0.012	0.039
B52-SD-003	B52-SD-003-0.5'	0.5	CT	12/8/15	<0.85	25	<0.85	<0.85	**25**
	B52-SD-003-1'	1.0	CT	12/8/15	<0.088	1.1	0.14	<0.088	**1.3**
	B52-SD-003-2'	2.0	CT	12/8/15	<0.088	<0.088	<0.088	<0.088	ND
	B52-SD-003-3'	3.0	CT	12/8/15	<0.013	<0.013	<0.013	<0.013	ND
	B52-SD-003-4'	4.0	CT	12/8/15	<0.09	<0.09	<0.09	<0.09	ND
B52-SD-004	B52-SD-004-0.5'	0.5	CT	12/8/15	<0.088	0.12	0.11	<0.088	0.23
	B52-SD-004-1'	1.0	CT	12/8/15	<0.09	<0.09	<0.09	<0.09	ND
B52-SD-005	B52-SD-005-0.5'	0.5	CT	12/9/15	<0.092	<0.092	<0.092	<0.092	ND
	B52-SD-005-1'	1.0	CT	12/9/15	<0.088	<0.088	<0.088	<0.088	ND
B52-SD-006	B52-SD-006-0.67'	0.7	CT	12/9/15	<0.093	<0.093	<0.093	<0.093	ND
	B52-SD-006-1'	1.0	CT	12/9/15	<0.091	<0.091	<0.091	<0.091	ND
B52-SD-007	B52-SD-007-0.5'	0.5	CT	12/9/15	<0.089	<0.089	<0.089	<0.089	ND
	(D)		CT	12/9/15	<0.012	0.018	<0.012	<0.012	ND
	B52-SD-007-1'	1.0	CT	12/9/15	<0.013	<0.013	<0.013	<0.013	ND
B52-SD-008	B52-SD-008-0.25'	0.3	CT	12/9/15	<0.083	6.3	0.98	<0.083	**7.3**
	B52-SD-008-1'	1.0	CT	12/9/15	<0.81	18	3.4	<0.81	**22**
	B52-SD-008-2'	2.0	CT	12/9/15	<0.072	2.8	0.48	<0.072	**3.3**
B52-SD-009	B52-SD-009-0.25'	0.3	CT	12/9/15	<0.081	5.6	1.4	<0.081	**7.0**
	B52-SD-009-1'	1.0	CT	12/9/15	<0.082	<0.082	<0.082	<0.082	ND
B52-SD-010	B52-SD-010-0.25'	0.3	CT	12/9/15	<0.082	1.4	0.45	<0.082	**1.9**
	B52-SD-010-1'	1.0	CT	12/10/15	<0.012	0.44	0.16	<0.012	0.6
B52-SD-012	B52-SD-012-0.5'	0.5	CT	12/10/15	<0.9	14	2.7	<0.9	**17**
	B52-SD-012-1'	1.0	CT	12/10/15	<0.012	0.46	0.085	<0.012	0.54
B52-SD-013	B52-SD-013-0.5'	0.5	CT	12/15/15	<0.081	<0.081	<0.081	<0.081	ND
	B52-SD-013-1'	1.0	CT	12/15/15	<0.012	<0.012	0.041	<0.012	0.041
B52-SD-014	B52-SD-014-0.5'	0.5	CT	12/15/15	<0.034	<0.034	0.095	<0.034	0.095
	B52-SD-014-1'	1.0	CT	12/15/15	<0.088	<0.088	<0.088	<0.088	ND
B52-SD-015	B52-SD-015-0.5'	0.5	CT	12/15/15	<0.034	<0.034	<0.034	<0.034	ND
	B52-SD-015-1'	1.0	CT	12/15/15	<0.072	<0.072	0.089	<0.072	0.089
B52-SD-016	B52-SD-016-0.5'	0.5	CT	12/15/15	<0.012	<0.012	0.1	<0.012	0.1
	B52-SD-016-1'	1.0	CT	12/15/15	<0.012	<0.012	0.072	<0.012	0.072

Table B-2 (Cont'd)
Soil Sampling Results from Old Town Demolition Project
Buildings 52/52A/Electrical Pad Area - Polychlorinated Biphenyls
(concentrations in mg/kg)

					PCBs-8082**				
					Aroclor-1242	**Aroclor-1254**	**Aroclor-1260**	**Aroclor-1268**	**Total PCBs**
				Screening Level*					0.97
Location	Sample ID	Depth (ft)	Lab	Date					
B52-SD-017	B52-SD-017-0.5'	0.5	CT	12/15/15	<0.078	<0.078	<0.078	<0.078	ND
	B52-SD-017-1'	1.0	CT	12/15/15	<0.088	<0.088	<0.088	<0.088	ND
	(D)	1.0	CT	12/15/15	<0.087	<0.087	<0.087	<0.087	ND
B52-SD-018	B52-SD-018-0.5'	0.5	CT	12/15/15	<0.013	<0.013	0.18	<0.013	0.18
	B52-SD-018-1'	1.0	CT	12/15/15	<0.013	<0.013	0.089	<0.013	0.089
B52-SD-019	B52-SD-019-0.5'	0.5	CT	12/15/15	<0.084	<0.084	<0.084	<0.084	ND
	B52-SD-019-1'	1.0	CT	12/15/15	<0.086	<0.086	<0.086	<0.086	ND
B52-SD-020	B52-SD-020-1'	1.0	CT	12/16/15	<0.073	1.2	0.36	0.073	**1.6**
	B52-SD-020-2'	2.0	CT	12/16/15	<0.091	<0.091	<0.091	<0.091	ND
	B52-SD-020-3'	3.0	CT	12/16/15	<0.087	<0.087	<0.087	<0.087	ND
	B52-SD-020-4'	4.0	CT	12/16/15	<0.088	<0.088	<0.088	<0.088	ND
B52-SD-021	B52-SD-021-1'	1.0	CT	12/16/15	<0.071	0.1	<0.071	<0.071	0.1
B52-SD-022	B52-SD-022-0.5'	0.5	CT	12/16/15	<0.071	<0.071	<0.071	<0.071	ND
	B52-SD-022-1'	1.0	CT	12/16/15	<0.01	<0.01	0.036	<0.01	0.036
B52-SD-023	B52-SD-023-1'	1.0	CT	12/16/15	<0.084	<0.084	<0.084	<0.084	ND
B52-SD-024	B52-SD-024-0.5'	0.5	CT	12/16/15	<0.07	0.097	<0.07	<0.07	0.097
	B52-SD-024-1'	1.0	CT	12/16/15	<0.08	0.084	<0.08	<0.08	0.84
B52-SD-025	B52-SD-025-0.5'	0.5	CT	12/16/15	<0.072	<0.072	<0.072	<0.072	ND
	B52-SD-025-1'	1.0	CT	12/16/15	<0.08	<0.08	0.19	<0.08	0.19
B52-SD-050	B52-SD-050-0.5'	0.5	CT	1/4/16	<0.09	<0.09	<0.09	<0.09	ND
	B52-SD-050-1'	1.0	CT	1/4/16	<0.086	<0.086	<0.086	<0.086	ND
B52-SD-051	B52-SD-051-0.5'	0.5	CT	1/4/16	<0.095	<0.095	<0.095	<0.095	ND
	(D)	0.5	CT	1/4/16	<0.093	<0.093	<0.093	<0.093	ND
	B52-SD-051-1'	1.0	CT	1/4/16	<0.085	<0.085	<0.085	<0.085	ND
B52-SD-052	B52-SD-052-0.5'	0.5	CT	1/4/16	<0.088	<0.088	<0.088	<0.088	ND
	B52-SD-052-1'	1.0	CT	1/4/16	<0.012	<0.012	<0.012	<0.012	ND
B52-SD-053	B52-SD-053-0.5'	0.5	CT	1/4/16	<0.089	<0.089	0.1	<0.089	0.1
	B52-SD-053-1'	1.0	CT	1/4/16	<0.084	<0.084	<0.084	<0.084	ND
B52-SD-054	B52-SD-054-0.5'	0.5	CT	1/8/16	<0.086	<0.086	<0.086	<0.086	ND
	(D)	0.5	CT	1/8/16	<0.092	<0.092	<0.092	<0.092	ND
	B52-SD-054-1'	1.0	CT	1/8/16	<0.088	<0.088	<0.088	<0.088	ND
B52-SD-055	B52-SD-055-0.5'	0.5	CT	1/8/16	<0.095	<0.095	<0.095	<0.095	ND
	B52-SD-055-1'	1.0	CT	1/8/16	<0.013	<0.013	<0.013	<0.013	ND
B52-SD-118	B52-SD-118 - 0.25'	0.25	CT	2/10/16	<0.082	0.23	0.14	<0.082	**0.38*** **
	B52-SD-118-1'	1.0	Ct	2/1016	<0.091	<0.091	<0.091	<0.091	<0.091***
SB52A-00-16	BS-SB52A-00-16-2	2.0	BC	3/17/00	<0.01	<0.01	<0.01		ND
SB52A-00-17	BS-SB52A-00-17-1	1.0	BC	3/17/00	<0.01	<0.01	<0.01		ND
SS52A-14-1	SS52A-14-1-0	0.0	CT	5/16/14	<0.083	1.2	0.15	<0.083	**1.35**
	SS52A-14-1-1.5	1.5	CT	7/18/14	<0.0095	<0.0095	<0.0095	<0.0095	ND
SS52A-14-1A	SS52A-14-1A-3"	0.0	CT	6/25/14	<0.0097	<0.0097	0.0053[J]	<0.0097	0.0053[J]
	SS52A-14-1A-1'	1.0	CT	6/25/14	<0.034	<0.034	<0.034	<0.034	ND
SS52A-14-1B	SS52A-14-1B-3"	0.0	CT	6/25/14	<0.34	18	3.7	<0.34	**21.7**
	SS52A-14-1B-1'	1.0	CT	6/25/14	<0.032	1.8	0.45	<0.032	**2.25**
	SS52A-14-1B-3'	3.0	CT	7/18/14	<0.0096	<0.0096	<0.0096	<0.0096	ND
SB52A-14-1C	SB52A-14-1C-3"	0.0	CT	6/25/14	<0.13	6.9	1.7	<0.13	**8.6**
	SB52A-14-1C-1'	1.0	CT	6/25/14	<0.33	25	6.6	<0.33	**31.6**
	SB52A-14-1C-3'	3.0	CT	7/18/14	<0.0096	0.17	0.037	<0.0096	0.207
SB52A-14-1D	SB52A-14-1D-0'	0.0	CT	7/18/14	<0.0098	0.065	0.027	<0.0098	0.092
	SB52A-14-1D-1'	1.0	CT	7/18/14	<0.034	2.0	0.66	<0.034	**2.66**

Table B-2 (Cont'd)
Soil Sampling Results from Old Town Demolition Project
Buildings 52/52A/Electrical Pad Area - Polychlorinated Biphenyls
(concentrations in mg/kg)

					PCBs-8082**				
					Aroclor-1242	**Aroclor-1254**	**Aroclor-1260**	**Aroclor-1268**	**Total PCBs**
				Screening Level*					0.97
Location	Sample ID	Depth (ft)	Lab	Date					
SB52A-14-1E	SB52A-14-1E-0'	0.0	CT	7/18/14	<0.069	2.3	0.79	<0.069	**3.09**
	SB52A-14-1E-1'	1.0	CT	7/18/14	<0.0098	0.073	0.049	<0.0098	0.122
SB52A-14-1F	SB52A-14-1F-0'	0.0	CT	7/18/14	<0.034	1.0	0.36	<0.034	**1.36**
	SB52A-14-1F-1'	1.0	CT	7/18/14	<0.0094	0.034	0.02	<0.0094	0.054
SB52A-14-1G	SB52A-14-1G-0'	0.0	CT	7/18/14	<0.0094	0.52	0.24	<0.0094	0.76
	SB52A-14-1G-1'	1.0	CT	7/18/14	<0.0099	<0.0099	0.054	<0.0099	0.054
SB52A-14-1H	SB52A-14-1H-0'	0.0	CT	7/18/14	<0.0095	<0.0095	<0.0095	<0.0095	ND
	SB52A-14-1H-1'	1.0	CT	7/18/14	<0.0099	0.074	0.011	<0.0099	0.085
	SB52A-14-1H-3'	3.0	CT	7/18/14	<0.0094	<0.0094	<0.0094	<0.0094	ND
SB52A-14-1I	SB52A-14-1I-0'	0.0	CT	7/18/14	<0.0098	0.48	0.47	<0.0098	0.95
SS52A-14-2	SS52A-14-2-0	0.0	CT	5/16/14	<0.012	<0.012	0.0068[J]	<0.012	0.0068[J]
SS52A-14-3	SS52A-14-3-0	0.0	CT	5/16/14	<0.012	<0.012	0.013	<0.012	0.013
SS52A-14-4	SS52A-14-4-0	0.0	CT	5/16/14	<0.012	<0.012	<0.012	<0.012	ND
SS52A-14-5	SS52A-14-5-3"	0.0	CT	6/26/14	<0.13	4.0	2.0	<0.13	**6.0**
	SS52A-14-5-1'	1.0	CT	6/26/14	<0.034	1.6	0.45	<0.034	**2.05**
SS52A-14-8	SS52A-14-8-0.5	0.5	CT	2/24/14	<0.2	<0.2	0.43		0.43
	SS52A-14-8-1.5	1.5	CT	2/24/14	<0.2	<0.2	<0.2		ND
SS52A-14-9	SS52A-14-9-0.5	0.5	CT	2/24/14	<0.2	<0.2	<0.2		ND
	SS52A-14-9-1.5	1.5	CT	2/24/14	<0.2	<0.2	<0.2		ND
SS52A-14-10	SS52A-14-10-0'	0.0	CT	6/4/14	<0.0099	0.4	0.12	<0.0099	0.52
	SS52A-14-10-1'	1.0	CT	6/4/14	<0.0095	0.013	0.016	<0.0095	0.029
SS52A-14-12	SS52A-14-12-0'	0.0	CT	6/4/14	<0.0098	0.11	0.13	<0.0098	0.24
	SS52A-14-12-1'	1.0	CT	6/4/14	<0.0099	0.13	0.13	<0.0099	0.26
SS52A-14-13	SS52A-14-13-0'	0.0	CT	6/4/14	<0.0099	0.3	0.37	<0.0099	0.67
	SS52A-14-13-1'	1.0	CT	6/4/14	<0.0099	0.14	0.32	<0.0099	0.46
SS52A-14-14	SS52A-14-14-3"	0.0	CT	6/25/14	<0.034	0.37	0.2	<0.034	0.57
	SS52A-14-14-1'	1.0	CT	6/25/14	<0.034	0.34	0.15	<0.034	0.49
SS52A-14-15	SS52A-14-15-3"	0.0	CT	6/25/14	<0.0094	0.087	0.031	<0.0094	0.118
	SS52A-14-15-1'	1.0	CT	6/25/14	<0.034	<0.034	<0.034	<0.034	ND
SS52A-14-16	SS52A-14-16-3"	0.0	CT	7/7/14	<0.067	0.14	0.34	<0.067	0.48
	SS52A-14-16-1'	1.0	CT	7/7/14	<0.0095	<0.0095	<0.0095	<0.0095	ND
B52A-SD-011	B52A-SD-011-0.5'	0.5	CT	12/11/15	<0.071	<0.071	<0.071	<0.071	ND
	(D)	0.5	CT	12/11/15	<0.07	<0.07	<0.07	<0.07	ND
	B52A-SD-011-1'	1.0	CT	12/11/15	<0.089	<0.089	<0.089	<0.089	ND
B16-SD-056	B16-SD-056-0.5'	0.5	CT	1/8/16	<0.089	0.24	0.35	<0.089	0.59
	B16-SD-056-1.0'	1.0	CT	1/8/16	<0.087	<0.087	0.13	<0.087	0.13
B16-SD-057	B16-SD-057-0.5'	0.5	CT	1/8/16	<0.092	<0.092	0.18	<0.092	0.18
	B16-SD-057-1.0'	1.0	CT	1/8/16	<0.091	<0.091	<0.091	<0.091	ND
	B16-SD-057-2.0'	2.0	CT	1/8/16	<0.09	<0.09	<0.09	<0.09	ND
	B16-SD-057-3.0'	3.0	CT	1/8/16	<0.09	<0.09	<0.09	<0.09	ND
	B16-SD-057-4.0'	4.0	CT	1/8/16	<0.088	<0.088	<0.088	<0.088	ND
B16-SD-058	B16-SD-058-0.5'	0.5	CT	1/11/16	<0.094	<0.094	4.7	<0.094	**4.7**
	B16-SD-058-1.0'	1.0	CT	1/11/16	<0.095	<0.095	0.3	<0.095	0.3
B16-SD-059	B16-SD-059-0.5'	0.5	CT	1/11/16	<0.091	<0.091	0.33	<0.091	0.33
	(D)	0.5	CT	1/11/16	<0.096	<0.096	0.35	<0.096	0.35
	B16-SD-059-1.0'	1.0	CT	1/11/16	<0.091	<0.091	0.19	<0.091	0.19

Table B-2 (Cont'd)
Soil Sampling Results from Old Town Demolition Project
Buildings 52/52A/Electrical Pad Area - Polychlorinated Biphenyls
(concentrations in mg/kg)

					PCBs-8082**				
					Aroclor-1242	**Aroclor-1254**	**Aroclor-1260**	**Aroclor-1268**	**Total PCBs**
				Screening Level*					0.97
Location	Sample ID	Depth (ft)	Lab	Date					
B16-SD-060	B16-SD-060-0.5'	0.5	CT	1/11/16	<0.014	0.044	0.055	<0.014	0.099
	B16-SD-060-1.0'	1.0	CT	1/11/16	<0.094	<0.094	<0.094	<0.094	ND
B16-SD-061	B16-SD-061-0.5'	0.5	CT	1/11/16	<0.089	0.12	0.35	<0.089	0.47
	B16-SD-061-1.0'	1.0	CT	1/11/16	<0.091	<0.091	<0.091	<0.091	ND

* Screening level for total PCBs is the Toxic Substances Control Act (TSCA) self-implementing cleanup level for PCBs in soil in high-occupancy areas.
** Analytes included Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, and 1268 unless otherwise noted.
CT: Analysis by Curtis & Tompkins Ltd
BC: Analysis by BC Laboratories, Inc.
Boldface type indicates concentration above screening level.
^{J} indicates an estimated value
< (shaded cell): concentration less than reporting limit (RL)
(blank cell): not analyzed
ND: No PCB Aroclors detected

Appendix C. Analytical Laboratory Reports and Data Validation Reports for 2015 Sampling at Buildings 52, 52A and the Electrical Pad

(provided on electronic media)

Appendix D. Groundwater Sampling Results for PCBs in the Old Town Demolition Project Area March 2, 2015.

BERKELEY LAB

Environment / Health / Safety DIVISION

Environmental Services

Via email and certified mail
Receipt No. 7009 2820 0004 4632 8621 Reference No.: ES-15-046

March 2, 2015

Ms. Carmen Santos
Regional PCB Coordinator
US EPA Region 9
75 Hawthorne Street
Mail Code: WST-5
San Francisco, CA 94105

Subject: Groundwater Sampling Results for Polychlorinated Biphenyls (PCBs) in the Old Town Demolition Project Area of Lawrence Berkeley National Laboratory

Dear Ms. Santos,

The purpose of this letter is to respond to your February 3, 2015 request for information on polychlorinated biphenyls (PCBs) in groundwater in the Old Town Demolition Project (Project) area at Lawrence Berkeley National Laboratory (LBNL). In order to provide up to date information, LBNL collected groundwater samples from 15 well locations in the Project area in February 2015 for PCB analysis. No PCBs were detected.

Background

On February 3, 2015 a conference call was held to discuss PCB contamination found in the Project area. Participants in the conference call included Carmen Santos (the United States Environmental Protection Agency (EPA) Region 9 PCB Coordinator), LBNL representatives, United States Department of Energy (DOE) representatives, and representatives of LBNL's demolition subcontractor DMS. A listing of the LBNL, DOE, and DMS attendees is provided as Attachment 1. During the call you requested information regarding groundwater monitoring data for PCBs. The requested information is provided below.

Historical PCB Groundwater Results

Between 1998 and 2007 LBNL collected 26 groundwater samples for PCB analysis from five wells located in the current Project area. No PCBs were detected. Table 1 in Attachment 2 provides a list of the wells sampled, the sampling dates, and the detection limits. Figure 1 in Attachment 2 is a map showing sampling locations, locations where PCBs were detected in soil samples, and groundwater flow directions.

Lawrence Berkeley National Laboratory
One Cyclotron Road | Berkeley, California 94720 | Mail Stop 75B0101 | Tel: 510.486.7614 | Fax: 510.486.6939
Email: ROPauer@lbl.gov

2015 PCB Groundwater Results

In order to provide a current and more comprehensive assessment of potential PCB contamination in the Project area groundwater, LBNL collected groundwater samples in February 2015 from 15 wells for PCB analysis. Groundwater samples were collected from 1) wells in the Project area located in or near areas where PCBs had been detected in the soil, except for one well with insufficient volume of water for sampling, and 2) a number of wells downgradient from the areas of soil contamination. Figure 2 in Attachment 2 shows the groundwater sampling locations, the locations where PCBs were detected in soil samples, and groundwater flow directions.

The Environmental Services Group (ESG) Sample Collection Form is included as Attachment 3. The Sample Collection Form provides the location (well number) of the wells that were scheduled for sampling, the corresponding Sample ID, the analytical laboratory, the requested analytical method, the date and time (if sampled), and the sample container. Environmental Restoration Program Groundwater Sampling Data Sheets are provided as Attachment 4. The data sheets include information on depth to groundwater, well purging volumes, water quality data, materials used for sampling, and instrument calibration.

Samples were collected in accordance with the methods specified in LBNL's ESG Procedure 233 Revision 01. All samples were analyzed by Curtis and Tompkins Ltd., a National Environmental Laboratory Accreditation Program (NELAP) certified laboratory located in Berkeley, California. Samples were analyzed for PCBs by EPA Method 8082. The two laboratory analytical reports that cover the 15 samples collected in February 2015 are provided as Attachment 5. No PCBs were detected (<0.5 µg/L).

Conclusion

The data collected during the evaluation described above indicates that no detectable PCBs are present in groundwater in the Old Town Demolition Project area.

If you have any questions or require additional information please contact David Baskin (dabaskin@lbl.gov) at 510-486-5684 or me (ropauer@lbl.gov) at 510-486-7614.

Sincerely,

Ron Pauer

Ron Pauer
Environmental Manager

Attachments:

1) Conference Call Participants
2) Table and Figures
3) Environmental Services Group Sample Collection Form
4) Environmental Restoration Program Groundwater Sampling Data Sheets
5) Curtis and Tompkins Analytical Reports (2)

cc via email w/attachments:

Kim Abbott (kvabbott@lbl.gov)
Steve Armann (armann.steve@epa.gov)
David Baskin (dabaskin@lbl.gov)
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Jacinto Soto jsoto@dtsc.ca.gov
Karen Toth (ktoth@dtsc.ca.gov)
Nancy Ware (NMWare@lbl.gov)

Attachment 1

February 3, 2015 Conference Call Participants

Meeting Attendance Register – Conference Call with EPA Regional PCB Coordinator on Old Town – Room 75-124-CR(20)

Meeting Date: February 3, 2015

Name	Organization	Telephone	Email
Ron Pauer	LBNL	486-7614	rapauer@lbl.gov
JOE GANTOS	LBNL	x 5077	njgantos@lbl.gov
JEFFREY PARKIN	DMS	x 6170	JPARKIN@DMSMP.COM
KIAN ATKINSON	DMS	x 6170	KATKINSON@DMSMP.COM
Dottie Norman	DMS	509-539-3405	dnorman@dmsmp.com
BRUCE MARVIN	GEOSYNTEC DMS	510 285 2753	BMARVIN@GEOSYNTEC.COM
BOB DEVANY	WEISS	510-450-6144	rod@weiss.com
TED MANKOWSKI	LBL	510-495-2012	tmankowski@LBL.GOV
Mary Gross	DOE-BSO	510-486-4373	Mary.Gross@science.DOE.GOV
Bob Cronin	LBNL	510-495-2849	rdcronin@LBL.gov
Joseph Harkins	LBNL	510-486-7486	jpharkins@lbl.gov
KEVIN BAZZELL	DOE-EM	510-486-5547	KEVIN.BAZZELL@EMCBC.DOE.GOV

Attachment 2

Table and Figures

Table 1
Old Town Demolition Project Area
Historical Groundwater Monitoring Results
Polychlorinated Biphenyls

Well Number	Sampling Date	Result[(a)]	Detection Limit
MW5-93-10	2/11/2015	ND	0.5 µg/L[(b)]
MW7-92-16	2/11/2015	ND	0.5 µg/L
MW16-94-13	6/10/1998	ND	0.2 µg/L
	5/28/1999	ND	0.2 µg/L
	9/12/2000	ND	0.2 µg/L
	9/12/2001	ND	0.2 µg/L
	9/4/2002	ND	0.2 µg/L
	8/20/2003	ND	0.2 µg/L
	2/11/2015	ND	0.5 µg/L[(b)]
MW16-95-3	2/11/2015	ND	0.5 µg/L[(b)]
MW52-93-14	4/11/2000	ND	0.3 µg/L
MW52-95-2B	2/10/2015	ND	0.5 µg/L[(b)]
MW52A-98-8B	2/10/2015	ND	0.5 µg/L[(b)]
MW52B-95-13	12/22/1998	ND	0.2 µg/L
	9/14/2000	ND	0.2 µg/L
	9/17/2003	ND	0.2 µg/L
	8/17/2004	ND	0.2 µg/L
	8/23/2007	ND	0.2 µg/L
	2/12/2015	ND	0.5 µg/L[(b)]
MW53-93-9	2/11/2015	ND	0.5 µg/L[(b)]
MW53-96-1	2/11/2015	ND	0.5 µg/L[(b)]
MW90-2	2/11/2015	ND	0.5 µg/L[(b)]
MW91-9	2/11/2015	ND	0.5 µg/L[(b)]
EW7C-04-2	2/10/2015	ND	0.5 µg/L[(b)]
SB7-97-1	2/12/2015	ND	0.5 µg/L[(b)]
SB16-97-11	4/7/2000	ND	0.2 µg/L
	5/16/2001	ND	0.2 µg/L
	3/26/2002	ND	0.2 µg/L
	3/5/2003	ND	0.2 µg/L
	3/8/2004	ND	0.2 µg/L
	3/21/2005	ND	0.2 µg/L
	2/12/2015	ND	0.5 µg/L[(b)]
SB16-98-1	3/22/1999	ND	0.5 µg/L
	6/16/1999	ND	0.2 µg/L
	10/17/2000	ND	0.2 µg/L
	10/3/2001	ND	0.2 µg/L
	3/22/2002	ND	0.2 µg/L
	9/30/2002	ND	0.2 µg/L
	9/17/2003	ND	0.2 µg/L
	9/13/2004	ND	0.2 µg/L
	2/12/2015	ND	0.5 µg/L[(b)]

(a) Aroclors: 1016, 1221, 1232, 1242, 1248, 1254, and 1260
(b) Aroclor 1221 detection limit is 1.0 µg/L
ND: No PCBs detected.

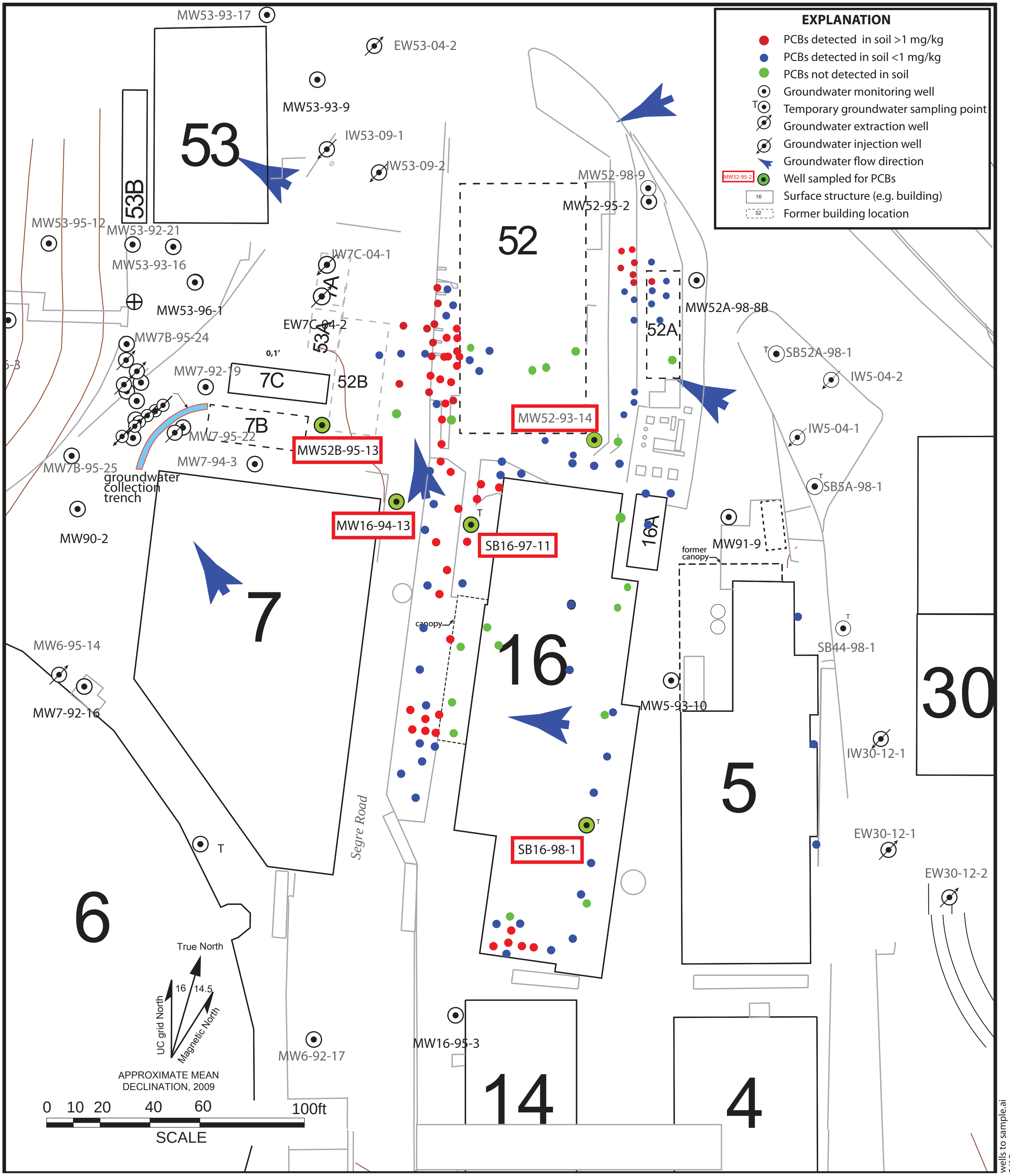

Figure 1. Locations of Old Town Demolition Project Area Wells Sampled for PCBs Before 2015.

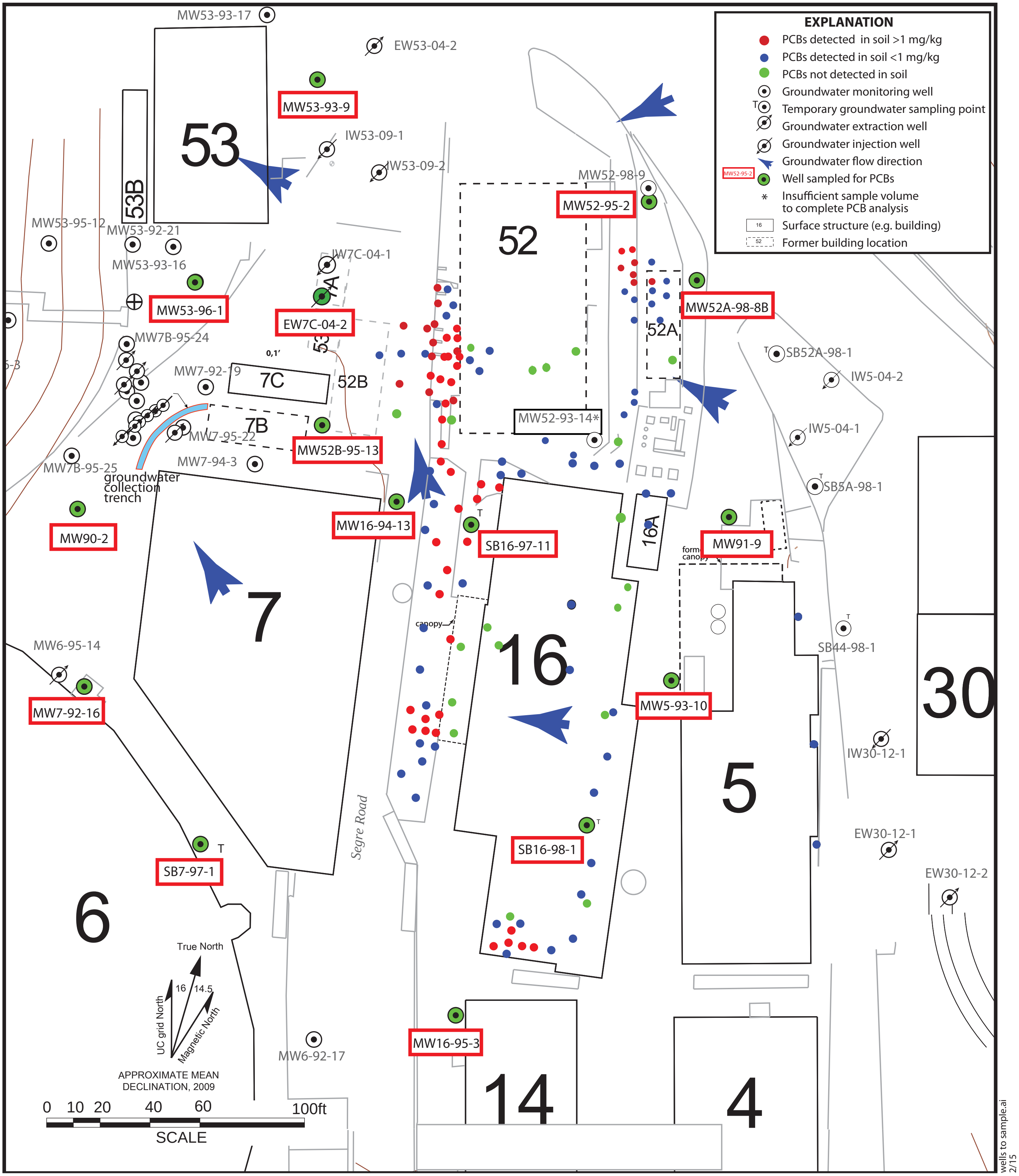

Figure 2. Locations of Old Town Demolition Project Area Wells Sampled for PCBs in February 2015.

Attachment 3

Environmental Services Group Sample Collection Forms

ESG Sample Collection Form

U.C. Lawrence Berkeley National Laboratory
1 Cyclotron Road
Berkeley CA 94720

Groundwater Monitoring
Old Town Groundwater Sampling in PCBs, Feb 2015
Collection: 7698

Sample Data

Sample ID	Location	SampleType	QC Type	Coll Type	Lab/Analysis	Date/time	Container(s)	Presv	Amount	Depth ft	Sample Notes
75180 2-15-47	MW16-94-13	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/11/2015 9:40:00 AM	2-1 Liter AG	None	1 S		
75181 2-15-44	MW16-95-3	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/11/2015 8:20:00 AM	2-1 Liter AG	None	1 S		
75182 2-15-55	SB16-97-11	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/12/2015 8:10:00 AM	2-1 Liter AG	None	1 S		
75183 2-15-57	SB16-98-1	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/12/2015 8:50:00 AM	2-1 Liter AG	None	1 S		
75184 2-15-46	MW5-93-10	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/11/2015 9:00:00 AM	2-1 Liter AG	None	1 S		
75185 2-15-49	MW7-92-16	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/11/2015 11:30:00 AM	2-1 Liter AG	None	1 S		
75186 2-15-53	SB7-97-1	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/12/2015 7:10:00 AM	2-1 Liter AG	None	1 S		
75187 2-15-36	EW7C-04-2	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/10/2015 9:45:00 AM	2-1 Liter AG	None	1 S		
75188 2-15-51	MW90-2	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/11/2015 12:35:00 PM	2-1 Liter AG	None	1 S		
75189 2-15-45	MW91-9	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/11/2015 8:40:00 AM	2-1 Liter AG	None	1 S		

Sample Data

Sample ID	Location	SampleType	QC Type	Coll Type	Lab/Analysis	Date/time	Container(s)	Presv	Amount	Depth ft	Sample Notes
75190	MW52-93-14	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A		2-1 Liter AG	None	1 S		
75191 2-15-37	MW52-95-2B	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/10/2015 10:30:00 AM	2-1 Liter AG	None	1 S		
75192 2-15-38	MW52A-98-8B	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/10/2015 10:50:00 AM	2-1 Liter AG	None	1 S		
75193 2-15-54	MW52B-95-13	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/12/2015 7:45:00 AM	2-1 Liter AG	None	1 S		
75194 2-15-48	MW53-93-9	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/11/2015 10:10:00 AM	2-1 Liter AG	None	1 S		
75195 2-15-50	MW53-96-1	Aqueous Sample Collected: **Yes**	Sample	Grab	CURTISTOMP E8082A	2/11/2015 12:10:00 PM	2-1 Liter AG	None	1 S		

Attachment 4

Environmental Restoration Program Groundwater Sampling Data Sheets

Lawrence Berkeley National Laboratory
Environmental Restoration Program
GROUNDWATER SAMPLING DATA

Work Dates: 2/10/2015 **Well Number:** EW7C-04-2

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	5	Purge Taget Volume (3 x c_v) (gal)	30.58
Total Depth (h_2) (ft):	80	Total Volume Purged (gal): (c_v)	nm
Initial Depth-to-Water (DTW) (ft):	70	Did well go dry? (y/n)	no
Water Column (H) (ft):	10	Post sample DTW (ft):	nm
Casing Volume (c_v) (gal):	10.19		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/10/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☑	
Sample Bottles	☑	
Teflon Bailer	☐	

DESCRIPTION OF WORK DONE

Grab sample collected from extraction well…. One set of parameters also collected

Work Dates: 2/10/2015 **Well Number:** EW7C-04-2

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (°C)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	9:40	0.00	17.3	7.05	558	Clear
0.5 cv		5.10				
1.0 cv		10.19				
1.5 cv		15.29				
2.0 cv		20.39				
2.5 cv		25.49				
3.0 cv		30.58				
--- cv						
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--- cv						

SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/10/2015	9:45	2-15-36	PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/10/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin

Digitally signed by David Baskin
DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US
Date: 2015.02.24 08:53:44 -08'00'

Date:

Lawrence Berkeley National Laboratory
Environmental Restoration Program
GROUNDWATER SAMPLING DATA

Work Dates: 2/11/2015 **Well Number:** MW16-94-13

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	15.34
Total Depth (h_2) (ft):	42.52	Total Volume Purged (gal): (3 c_v)	15.34
Initial Depth-to-Water (DTW) (ft):	11.17	Did well go dry? (y/n)	n
Water Column (H) (ft):	31.35	Post sample DTW (ft):	40.4
Casing Volume (c_v) (gal):	5.11		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/11/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☑	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Pumped 3 cvs- collected samples

Work Dates: 2/11/2015 **Well Number:** MW16-94-13

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (^oC)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	9:27	0.00	14.8	7.45	603	clear
0.5 cv	9:28	2.56	16.7	7.25	590	clear
1.0 cv	9:30	5.11	17.5	7.17	587	clear
1.5 cv	9:32	7.67	18.0	7.18	586	clear
2.0 cv	9:34	10.23	18.6	7.24	589	clear
2.5 cv	9:36	12.78	18.3	7.27	599	clear
3.0 cv	9:37	15.34	18.1	7.31	601	clear
--- cv						
--- cv						
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--- cv						

SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/11/2015	9:40	2-15-47	PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/11/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin Digitally signed by David Baskin DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US Date: 2015.02.24 08:55:12 -08'00' Date:

Lawrence Berkeley National Laboratory

Environmental Restoration Program

GROUNDWATER SAMPLING DATA

Work Dates: 2/11/2015 **Well Number:** MW16-95-3

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	11.53
Total Depth (h_2) (ft):	38.34	Total Volume Purged (gal): (3 c_v)	11.53
Initial Depth-to-Water (DTW) (ft):	14.77	Did well go dry? (y/n)	N
Water Column (H) (ft):	23.57	Post sample DTW (ft):	35.6
Casing Volume (c_v) (gal):	3.84		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/11/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☑	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Pumped 3 cvs- collected samples

Work Dates: 2/11/2015 **Well Number:** MW16-95-3

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (^{o}C)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	8:10	0.00	12.5	7.39	495	clear
0.5 cv	8:11	1.92	15.4	7.24	508	clear
1.0 cv	8:12	3.84	16.8	7.19	495	clear
1.5 cv	8:13	5.77	17.9	7.17	508	clear
2.0 cv	8:14	7.69	18.4	7.14	500	clear
2.5 cv	8:15	9.61	17.9	7.14	495	clear
3.0 cv	8:16	11.53	18.1	7.17	497	clear
--- cv						
--- cv						
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--- cv						

SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/11/2015	8:20	2-15-44	PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/11/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin

Digitally signed by David Baskin
DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US
Date: 2015.02.24 08:55:44 -08'00'

Date:

Lawrence Berkeley National Laboratory
Environmental Restoration Program
GROUNDWATER SAMPLING DATA

Work Dates: 2/10/15, 2/17/15 **Well Number:** MW52-93-14

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	0.66
Total Depth (h_2) (ft):	40.05	Total Volume Purged (gal): (c_v)	0.66
Initial Depth-to-Water (DTW) (ft):	38.7	Did well go dry? (y/n)	yes
Water Column (H) (ft):	1.35	Post sample DTW (ft):	NA
Casing Volume (c_v) (gal):	0.22		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/10/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☐	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Bailed well dry- returned 2/17/15 to collect samples. Well only had about 1/3 liter of water. Not enough for a representative sample….jkc

Work Dates: 2/10/15, 2/17/15 **Well Number:** MW52-93-14

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (°C)	pH	Conductivity (μs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	13:48	0.00	17.7	8.00	475	Turbid-brown
0.5 cv	13:50	0.11	17.4	7.92	481	Turbid-brown
1.0 cv	13:52	0.22	17.0	7.75	483	Turbid-brown
1.5 cv	13:54	0.33				Dry at .3 gallons
2.0 cv		0.44				
2.5 cv		0.55				
3.0 cv		0.66				
--- cv						
--- cv						
--- cv						
--- cv						

SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
			PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/12/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin Digitally signed by David Baskin DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US Date: 2015.02.24 08:56:12 -08'00' Date:

Lawrence Berkeley National Laboratory
Environmental Restoration Program
GROUNDWATER SAMPLING DATA

Work Dates: **2/10/2015** **Well Number:** **MW52-95-2B**

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	27.85
Total Depth (h_2) (ft):	109.12	Total Volume Purged (gal): (c_v)	27.85
Initial Depth-to-Water (DTW) (ft):	52.2	Did well go dry? (y/n)	no
Water Column (H) (ft):	56.92	Post sample DTW (ft):	62.1
Casing Volume (c_v) (gal):	9.28		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/10/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☑	
Sample Bottles	☑	
Teflon Bailer	☐	

DESCRIPTION OF WORK DONE

Pumped 3 cvs- collected samples from sampling port. (Has a dedicated pump)

Work Dates: 2/10/2015 **Well Number:** MW52-95-2B

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (°C)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	10:08	0.00	16.9	7.31	613	Clear
0.5 cv	10:11	4.64	18.0	7.18	593	Clear
1.0 cv	10:14	9.28	18.4	7.15	592	Clear
1.5 cv	10:17	13.93	18.5	7.15	591	Clear
2.0 cv	10:20	18.57	18.5	7.17	590	Clear
2.5 cv	10:23	23.21	18.5	7.17	591	Clear
3.0 cv	10:26	27.85	18.5	7.20	590	Clear
--- cv						
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--- cv						

SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/10/2015	10:30	2-15-37	PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/10/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin Digitally signed by David Baskin DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US Date: 2015.02.24 08:56:44 -08'00' Date:

Lawrence Berkeley National Laboratory
Environmental Restoration Program
GROUNDWATER SAMPLING DATA

Work Dates: **2/10/2015** **Well Number:** **MW52A-98-8B**

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	10.81
Total Depth (h_2) (ft):	80	Total Volume Purged (gal): (c_v)	10.81
Initial Depth-to-Water (DTW) (ft):	57.9	Did well go dry? (y/n)	No
Water Column (H) (ft):	22.1	Post sample DTW (ft):	67.5
Casing Volume (c_v) (gal):	3.60		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/10/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☑	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Pumped 3 cvs- collected samples from sampling port (Has a dedicated pump)

Work Dates: 2/10/2015 **Well Number:** MW52A-98-8B

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (°C)	pH	Conductivity (μs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	10:33	0.00	18.2	7.20	670	clear
0.5 cv	10:35	1.80	18.4	7.07	843	clear
1.0 cv	10:37	3.60	18.5	7.10	839	clear
1.5 cv	10:39	5.41	18.7	7.13	837	clear
2.0 cv	10:41	7.21	18.7	7.16	842	clear
2.5 cv	10:43	9.01	18.7	7.17	839	clear
3.0 cv	10:45	10.81	18.7	7.16	840	clear
--- cv						
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SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/10/2015	10:50	2-15-38	PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/10/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin Digitally signed by David Baskin DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US Date: 2015.02.24 08:57:08 -08'00' Date:

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GROUNDWATER SAMPLING DATA

Work Dates: 2/12/2015 **Well Number:** MW52B-95-13

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu			
Well Diameter (in):	1	Purge Taget Volume (3 x c_v) (gal)	1.45
Total Depth (h_2) (ft):	27.93	Total Volume Purged (gal): (c_v)	1.45
Initial Depth-to-Water (DTW) (ft):	16.04	Did well go dry? (y/n)	no
Water Column (H) (ft):	11.89	Post sample DTW (ft):	22.2
Casing Volume (c_v) (gal):	0.48		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/12/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☑	**Notes:**
Rediflow Pump	☐	
Sample Bottles	☑	
Teflon Bailer	☐	

DESCRIPTION OF WORK DONE

Pumped 3 cvs- collected samples

Work Dates: 2/12/2015 **Well Number:** MW52B-95-13

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (^oC)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	7:28	0.00	15.4	7.00	539	Clear
0.5 cv	7:30	0.24	16.4	7.02	527	Clear
1.0 cv	7:32	0.48	16.9	7.06	526	Clear
1.5 cv	7:35	0.73	17.0	7.02	524	Clear
2.0 cv	7:37	0.97	17.0	7.05	528	Clear
2.5 cv	7:40	1.21	17.0	7.04	530	Clear
3.0 cv	7:42	1.45	17.1	7.05	532	Clear
--- cv						
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SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/12/2015	7:45	2-15-54	PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/12/2015

Other Field Personnel:

Reviewed by (sign): David Baskin Digitally signed by David Baskin DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US Date: 2015.02.24 08:57:34 -08'00' Date:

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GROUNDWATER SAMPLING DATA

Work Dates: 2/11/2015 **Well Number:** MW53-93-9

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	14.69
Total Depth (h_2) (ft):	87.7	Total Volume Purged (gal): (3 c_v)	14.69
Initial Depth-to-Water (DTW) (ft):	57.67	Did well go dry? (y/n)	N
Water Column (H) (ft):	30.03	Post sample DTW (ft):	58.13
Casing Volume (c_v) (gal):	4.90		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/11/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☑	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Pumped 3 cvs- collected samples

Work Dates: 2/11/2015 **Well Number:** MW53-93-9

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (^{o}C)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	9:55	0.00	16.6	7.21	513	semi-turbid, brownish color
0.5 cv	9:56	2.45	16.7	7.10	532	semi-turbid, brownish color
1.0 cv	9:58	4.90	18.5	7.05	531	semi-turbid, brownish color
1.5 cv	9:59	7.35	18.8	7.05	531	semi-clear
2.0 cv	10:03	9.80	18.7	7.38	533	semi-clear
2.5 cv	10:04	12.25	19.0	7.18	533	clear
3.0 cv	10:06	14.69	19.5	7.13	533	clear
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SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/11/2015	10:10	2-15-48	PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/11/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin Digitally signed by David Baskin DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US Date: 2015.02.24 08:37:37 -08'00' Date:

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Environmental Restoration Program
GROUNDWATER SAMPLING DATA

Work Dates: **2/11/2015** **Well Number:** **MW53-96-1**

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	4	Purge Taget Volume (3 x c_v) (gal)	69.05
Total Depth (h_2) (ft):	81.4	Total Volume Purged (gal): (3 c_v)	69.05
Initial Depth-to-Water (DTW) (ft):	46.12	Did well go dry? (y/n)	N
Water Column (H) (ft):	35.28	Post sample DTW (ft):	75.5
Casing Volume (c_v) (gal):	23.02		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/11/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☑	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Pumped 3 cvs- collected samples

Work Dates: 2/11/2015 **Well Number:** MW53-96-1

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (^oC)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	11:43	0.00	17.6	7.20	646	clear
0.5 cv	11:47	11.51	19.2	7.00	616	clear
1.0 cv	11:50	23.02	19.8	6.98	607	clear
1.5 cv	11:53	34.53	20.2	7.00	606	clear
2.0 cv	11:57	46.03	20.2	7.00	606	clear
2.5 cv	12:00	57.54	20.1	6.99	607	clear
3.0 cv	12:04	69.05	20.0	6.99	608	clear
--- cv						
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SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/11/2015	12:10	2-15-50	PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/11/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin Digitally signed by David Baskin DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US Date: 2015.02.24 08:58:23 -08'00' Date:

Lawrence Berkeley National Laboratory
Environmental Restoration Program
GROUNDWATER SAMPLING DATA

Work Dates: 2/11/2015 **Well Number:** MW5-93-10

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	10.38
Total Depth (h_2) (ft):	36.7	Total Volume Purged (gal): (3 c_v)	10.38
Initial Depth-to-Water (DTW) (ft):	15.48	Did well go dry? (y/n)	N
Water Column (H) (ft):	21.22	Post sample DTW (ft):	20.5
Casing Volume (c_v) (gal):	3.46		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/11/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☑	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Pumped 3 cvs- collected samples

Work Dates: 2/11/2015 **Well Number:** MW5-93-10

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (^{o}C)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	8:49	0.00	12.7	7.79	882	cloudy
0.5 cv	8:50	1.73	15.8	7.27	520	cloudy
1.0 cv	8:52	3.46	17.0	7.18	510	clear
1.5 cv	8:53	5.19	17.2	7.16	513	clear
2.0 cv	8:55	6.92	17.6	7.15	510	clear
2.5 cv	8:56	8.65	17.7	7.15	506	clear
3.0 cv	8:57	10.38	17.8	7.15	502	clear
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SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/11/2015	9:00	2-15-46	PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/11/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin Digitally signed by David Baskin DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US Date: 2015.02.24 08:58:52 -08'00' Date:

Lawrence Berkeley National Laboratory
Environmental Restoration Program
GROUNDWATER SAMPLING DATA

Work Dates: **2/11/2015** **Well Number:** **MW7-92-16**

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	18.96
Total Depth (h_2) (ft):	60.4	Total Volume Purged (gal): (3 c_v)	18.96
Initial Depth-to-Water (DTW) (ft):	21.65	Did well go dry? (y/n)	N
Water Column (H) (ft):	38.75	Post sample DTW (ft):	22.2
Casing Volume (c_v) (gal):	6.32		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/11/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☑	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Pumped 3 cvs- collected samples

Work Dates: 2/11/2015 **Well Number:** MW7-92-16

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (^oC)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	11:13	0.00	17.7	7.15	496	semi-turbid, brownish color
0.5 cv	11:15	3.16	18.4	6.95	452	clear
1.0 cv	11:17	6.32	18.8	6.94	420	clear
1.5 cv	11:19	9.48	19.0	6.96	412	clear
2.0 cv	11:21	12.64	19.0	6.97	408	clear
2.5 cv	11:23	15.80	19.1	6.98	407	clear
3.0 cv	11:24	18.96	19.0	6.98	406	clear
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SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/11/2015	11:30	2-15-49	PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/11/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin Digitally signed by David Baskin DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US Date: 2015.02.24 08:59:24 -08'00' Date:

Lawrence Berkeley National Laboratory
Environmental Restoration Program
GROUNDWATER SAMPLING DATA

Work Dates: 2/11/2015 **Well Number:** MW90-2

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	8.20
Total Depth (h_2) (ft):	35.5	Total Volume Purged (gal): (3 c_v)	8.2
Initial Depth-to-Water (DTW) (ft):	18.75	Did well go dry? (y/n)	N
Water Column (H) (ft):	16.75	Post sample DTW (ft):	29.43
Casing Volume (c_v) (gal):	2.73		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/11/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☑	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Pumped 3 cvs- collected samples

Work Dates: **2/11/2015** **Well Number:** **MW90-2**

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (^{o}C)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	12:26	0.00	19.5	7.92	531	semi-turbid, dark grey sediment
0.5 cv	12:27	1.37	21.6	7.34	531	semi-clear
1.0 cv	12:28	2.73	21,1	7.14	329	clear
1.5 cv	12:29	4.10	20.8	6.91	329	clear
2.0 cv	12:30	5.46	20.5	6.86	566	clear
2.5 cv	12:30	6.83	20.2	6.82	572	clear
3.0 cv	12:31	8.20	20.2	6.79	575	clear
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SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/11/2015	12:35	2-15-51	PCB's	JKC/NS	
2/11/2015	12:40	2-15-52	8260	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/11/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin

Digitally signed by David Baskin
DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US
Date: 2015.02.24 08:59:53 -08'00'

Date:

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GROUNDWATER SAMPLING DATA

Work Dates: 2/11/2015 **Well Number:** MW91-9

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	10.45
Total Depth (h_2) (ft):	38.5	Total Volume Purged (gal): (3 c_v)	10.45
Initial Depth-to-Water (DTW) (ft):	17.15	Did well go dry? (y/n)	N
Water Column (H) (ft):	21.35	Post sample DTW (ft):	18.3
Casing Volume (c_v) (gal):	3.48		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/11/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☑	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Pumped 3 cvs- collected samples

Work Dates: 2/11/2015 **Well Number:** MW91-9

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (^oC)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	8:30	0.00	11.3	7.44	388	semi-turbid - cloudy
0.5 cv	8:31	1.74	15.6	7.24	543	semi-turbid - cloudy
1.0 cv	8:32	3.48	15.9	7.22	538	semi-clear
1.5 cv	8:33	5.22	17.2	7.22	536	semi-clear
2.0 cv	8:34	6.96	17.5	7.23	535	clear
2.5 cv	8:35	8.71	17.6	7.25	534	clear
3.0 cv	8:36	10.45	17.7	7.26	534	clear
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SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/11/2015	8:40	2-15-45	PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/11/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin Digitally signed by David Baskin DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US Date: 2015.02.24 09:00:21 -08'00' Date:

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Environmental Restoration Program

GROUNDWATER SAMPLING DATA

Work Dates: 2/10/15,2/12/15 **Well Number:** SB16-97-11

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	1.13
Total Depth (h_2) (ft):	25.1	Total Volume Purged (gal): (c_v)	0.6
Initial Depth-to-Water (DTW) (ft):	22.8	Did well go dry? (y/n)	yes
Water Column (H) (ft):	2.3	Post sample DTW (ft):	dry
Casing Volume (c_v) (gal):	0.38		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/10/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☐	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Bailed well dry, returned 2/12/15 to samples

Work Dates: 2/10/15,2/12/15 **Well Number:** SB16-97-11

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (^oC)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	13:59	0.00	17.1	6.88	773	Semi-clear
0.5 cv	14:01	0.19	18.0	6.75	609	Semi-clear
1.0 cv	14:03	0.38	18.1	6.73	543	Semi-clear
1.5 cv	14:05	0.56				Dry at .5 gallons
2.0 cv		0.75				
2.5 cv		0.94				
3.0 cv		1.13				
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SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/12/2015	8:10	2-15-55	PCB's	JKC/NS	
2/12/2015	8:15	2-15-56	8260		

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/12/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin

Digitally signed by David Baskin
DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US
Date: 2015.02.24 09:00:56 -08'00'

Date:

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Environmental Restoration Program
GROUNDWATER SAMPLING DATA

Work Dates: **2/12/2015** **Well Number:** **SB16-98-1**

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	6.64
Total Depth (h_2) (ft):	27.2	Total Volume Purged (gal): (c_v)	6.64
Initial Depth-to-Water (DTW) (ft):	13.64	Did well go dry? (y/n)	no
Water Column (H) (ft):	13.56	Post sample DTW (ft):	22.5
Casing Volume (c_v) (gal):	2.21		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/12/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☐	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Bailed 3 cvs- collected samples

Work Dates: 2/12/2015 **Well Number:** SB16-98-1

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (^{o}C)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	8:25	0.00	15.7	7.33	552	turbid brown
0.5 cv	8:28	1.11	17.0	7.32	553	turbid brown
1.0 cv	8:31	2.21	17.4	7.34	555	turbid brown
1.5 cv	8:35	3.32	17.4	7.38	551	turbid brown
2.0 cv	8:37	4.42	17.4	7.35	554	turbid brown
2.5 cv	8:42	5.53	17.4	7.37	555	turbid brown
3.0 cv	8:44	6.64	17.4	7.41	552	turbid brown
--- cv						
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SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/12/2015	8:50	2-15-57	PCB's	JKC	
2/12/2015	8:55	2-15-58	8260	JKC	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/12/2015

Other Field Personnel:

Reviewed by (sign): David Baskin Digitally signed by David Baskin DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US Date: 2015.02.24 09:01:34 -08'00' Date:

Lawrence Berkeley National Laboratory
Environmental Restoration Program
GROUNDWATER SAMPLING DATA

Work Dates: 2/11/2015 **Well Number:** SB7-97-1

GENERAL INFORMATION

Field Personnel (Print): Jim Chiu, Neel Singh			
Well Diameter (in):	2	Purge Taget Volume (3 x c_v) (gal)	11.75
Total Depth (h_2) (ft):	31.5	Total Volume Purged (gal): (<1.5c_v)	5
Initial Depth-to-Water (DTW) (ft):	7.49	Did well go dry? (y/n)	Y
Water Column (H) (ft):	24.01	Post sample DTW (ft):	17.7
Casing Volume (c_v) (gal):	3.92		

CALIBRATION

Instrument Name	Instrument Number	Date	Calibration Results Standard	Calibrated? (Y/N)	Initial
HACH	HQ40d	2/11/2015	pH 4.01	Yes	JKC
			pH 10.01	Yes	JKC
			1000 µs/cm	Yes	JKC

MATERIALS USED

Peristoltic Pump	☐	**Notes:**
Rediflow Pump	☑	
Sample Bottles	☑	
Teflon Bailer	☑	

DESCRIPTION OF WORK DONE

Pumped well dry, returned 2/12/15 to collect sample

Work Dates: 2/11/2015 **Well Number:** SB7-97-1

WATER QUALITY DATA

Casing Volume	Time	Cummulative Volume (Gallons)	Temperature (^oC)	pH	Conductivity (µs/cm)	Qualitative Observations (color, turbidity, odors, sediment
Beginning	10:56	0.00	16.0	7.87	735	clear
0.5 cv	10:58	1.96	17.0	7.56	311	semi-turbid, brownish color
1.0 cv	11:01	3.92	17.5	7.19	308	semi-turbid, brownish color
1.5 cv	-	5.87	-	-	-	dry at 5 gal
2.0 cv		7.83				
2.5 cv		9.79				
3.0 cv		11.75				
--- cv						
--- cv						
--- cv						
--- cv						

SAMPLE INFORMATION

Sample Date	Sample Time	Sample Number	Analysis Requested	Sampler's Initials	Chain-of-Custody Number
2/12/2015	7:10	2-15-53	PCB's	JKC/NS	

ACKNOWLEDGMENT AND REVIEW

Prepared by (print): Jim Chiu Date: 2/12/2015

Other Field Personnel: Neel Singh

Reviewed by (sign): David Baskin Digitally signed by David Baskin DN: cn=David Baskin, o=LBNL, ou=ESG, email=dabaskin@lbl.gov, c=US Date: 2015.02.24 09:02:22 -08'00' Date:

Attachment 5

Analytical Report


Curtis & Tompkins, Ltd.
Analytical Laboratories, Since 1878

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 264562
ANALYTICAL REPORT

Lawrence Berkeley National Lab	Project : STANDARD
1 Cyclotron Road	Location : GWMP - Old Town Groundwater PCBs
Berkeley, CA 94720	Level : II

Sample ID	Lab ID
75187	264562-001
75191	264562-002
75192	264562-003

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: Isabelle Choy   Date: 02/18/2015

Isabelle Choy
Project Manager
isabelle.choy@ctberk.com

CA ELAP# 2896, NELAP# 4044-001

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**264562**
Client:	**Lawrence Berkeley National Lab**
Location:	**GWMP - Old Town Groundwater PCBs**
Request Date:	**02/10/15**
Samples Received:	**02/10/15**

This data package contains sample and QC results for three water samples, requested for the above referenced project on 02/10/15. The samples were received on ice and intact. All holding times and calibration criteria were met.

PCBs (EPA 8082):
All samples underwent sulfuric acid cleanup using EPA Method 3665A. All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. No analytical problems were encountered.

U.C. Lawrence Berkeley National Laboratory
1 Cyclotron Road
Berkeley CA 94720

264562

LBNL ENVIRONMENTAL RESTORATION
Chain of Custody

Send final reports to: Suying Xu, Mailstop 75B0101
Send preliminary results to: Iraj Javandel, e-mail: IJavandel@lbl.gov
Phone: 510-486-6106 **Fax:** 510-486-8694

Purpose: Groundwater Monitoring Program - Old Town Groundwater Sampling in PCBs, Feb 2015

COC No.: 08339

Page 1 of 1

Collection(s): **7698**

[redacted]

75187	2/10/2015 9:45	2/10/2015 9:45	Aqueous	1 Liter AG	2	None	E8082A	2-15-36	
75191	2/10/2015 10:30	2/10/2015 10:30	Aqueous	1 Liter AG	2	None	E8082A	2-15-37	
75192	2/10/2015 10:50	2/10/2015 10:50	Aqueous	1 Liter AG	2	None	E8082A	2-15-38	

Total No. of Containers: 6
Shipping Document ID:
Turnaround Time**:** 5 days
Lab Name: CURTISTOMP
Sampled by: JKC

Special Instructions/Comments:
SAMPLES DELIVERED ON BLUE ICE

Relinquished By (Sampler)		Relinquished By		Relinquished By	
Signature: [signature]	Time: 12:55	Signature	Time	Signature	Time
Printed Name: Jimmy K Chiu	Date: 2/10/15	Printed Name	Date	Printed Name	Date
Company: LBNL		Company		Company	

Received By		Received By		Received By	
Signature: Troy Bubba	Time: 1255	Signature	Time	Signature	Time
Printed Name: Troy Bubba	Date: 2/10/15	Printed Name	Date	Printed Name	Date
Company: CAT		Company		Company	

*REFERENCE DATE/TIME: Use this value for decay calculations in radiological analyses when applicable **Container Codes: AG = amber glass CG = clear glass PE = polyethylene VV = VOA vial
*** Field Sample ID: If present, use this information as the sample identifier in hard-copy reports (please include Sample Location information in the notes). If blank, and in electronic deliverable files, use Sample Location as the identifier. ****Listed turnaround time is for reporting and is in work days, as defined in the Joint LBNL/LLNL Analytical Services blanket order.

COOLER RECEIPT CHECKLIST

Curtis & Tompkins, Ltd.

Login # 264562 Date Received 2/10/15 Number of coolers 1
Client LBNL Project GWMP - Old Town Groundwater Sampling in PCBs

Date Opened 2/10 By (print) BL (sign)
Date Logged in ↓ By (print) ↓ (sign) ↓

1. Did cooler come with a shipping slip (airbill, etc) YES **NO**
   Shipping info

2A. Were custody seals present? .... ☐ YES (circle) on cooler on samples ☒ NO
   How many Name Date
2B. Were custody seals intact upon arrival? YES NO **N/A**
3. Were custody papers dry and intact when received? **YES** NO
4. Were custody papers filled out properly (ink, signed, etc)? **YES** NO
5. Is the project identifiable from custody papers? (If so fill out top of form) **YES** NO
6. Indicate the packing in cooler: (if other, describe)

☒ Bubble Wrap ☐ Foam blocks ☐ Bags ☐ None
☐ Cloth material ☐ Cardboard ☐ Styrofoam ☐ Paper towels

7. Temperature documentation: * Notify PM if temperature exceeds 6°C

Type of ice used: ☐ Wet ☒ Blue/Gel ☐ None Temp(°C)

☐ Samples Received on ice & cold without a temperature blank; temp. taken with IR gun

☐ Samples received on ice directly from the field. Cooling process had begun

8. Were Method 5035 sampling containers present? YES **NO**
   If YES, what time were they transferred to freezer?
9. Did all bottles arrive unbroken/unopened? **YES** NO
10. Are there any missing / extra samples? YES **NO**
11. Are samples in the appropriate containers for indicated tests? **YES** NO
12. Are sample labels present, in good condition and complete? **YES** NO
13. Do the sample labels agree with custody papers? **YES** NO
14. Was sufficient amount of sample sent for tests requested? **YES** NO
15. Are the samples appropriately preserved? YES NO **N/A**
16. Did you check preservatives for all bottles for each sample? YES NO **N/A**
17. Did you document your preservative check? YES NO **N/A**
18. Did you change the hold time in LIMS for unpreserved VOAs? YES NO **N/A**
19. Did you change the hold time in LIMS for preserved terracores? YES NO **N/A**
20. Are bubbles > 6mm absent in VOA samples? YES NO **N/A**
21. Was the client contacted concerning this sample delivery? YES **NO**
   If YES, Who was called? By Date:

COMMENTS

Curtis & Tompkins, Ltd.

Detections Summary for 264562

Results for any subcontracted analyses are not included in this summary.

Client : Lawrence Berkeley National Lab
Project : STANDARD
Location : GWMP - Old Town Groundwater PCBs

Client Sample ID : 75187 Laboratory Sample ID : 264562-001

No Detections

Client Sample ID : 75191 Laboratory Sample ID : 264562-002

No Detections

Client Sample ID : 75192 Laboratory Sample ID : 264562-003

No Detections

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	264562	Cert #:	CA ELAP# 2896, NELAP# 4044-001
Client:	Lawrence Berkeley National Lab	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8082
Location:	GWMP - Old Town Groundwater PCBs		
COC #:	08339	Diln Fac:	1.000
Requested:	E8082A	Batch#:	220278
Matrix:	Water	Instrument:	GC16
Units:	ug/L	Received:	02/10/15

Field ID:	75187	Sampled:	02/10/15 09:45
Type:	SAMPLE	Prepared:	02/10/15 15:00
Lab ID:	264562-001	Analyzed:	02/12/15 01:52
Chemist:	AVW		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.50	
Aroclor-1221	6500	ND	1.0	0.32
Aroclor-1232	6550	ND	0.50	
Aroclor-1242	6600	ND	0.50	
Aroclor-1248	6650	ND	0.50	
Aroclor-1254	6700	ND	0.50	
Aroclor-1260	6750	ND	0.50	

Surrogate	Code	%REC	Limits
TCMX	8256	67	39-120
Decachlorobiphenyl	3111	86	28-120

Field ID:	75191	Sampled:	02/10/15 10:30
Type:	SAMPLE	Prepared:	02/10/15 15:00
Lab ID:	264562-002	Analyzed:	02/12/15 02:20
Chemist:	AVW		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.50	
Aroclor-1221	6500	ND	1.0	0.32
Aroclor-1232	6550	ND	0.50	
Aroclor-1242	6600	ND	0.50	
Aroclor-1248	6650	ND	0.50	
Aroclor-1254	6700	ND	0.50	
Aroclor-1260	6750	ND	0.50	

Surrogate	Code	%REC	Limits
TCMX	8256	59	39-120
Decachlorobiphenyl	3111	81	28-120

ND= Not Detected
RL= Reporting Limit
MDL= Method Detection Limit

Polychlorinated Biphenyls (PCBs)

Lab #:	264562	Cert #:	CA ELAP# 2896, NELAP# 4044-001
Client:	Lawrence Berkeley National Lab	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8082
Location:	GWMP - Old Town Groundwater PCBs		
COC #:	08339	Diln Fac:	1.000
Requested:	E8082A	Batch#:	220278
Matrix:	Water	Instrument:	GC16
Units:	ug/L	Received:	02/10/15

Field ID:	75192	Sampled:	02/10/15 10:50
Type:	SAMPLE	Prepared:	02/11/15 13:55
Lab ID:	264562-003	Analyzed:	02/14/15 02:15
Chemist:	ICK		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.50	
Aroclor-1221	6500	ND	1.0	0.32
Aroclor-1232	6550	ND	0.50	
Aroclor-1242	6600	ND	0.50	
Aroclor-1248	6650	ND	0.50	
Aroclor-1254	6700	ND	0.50	
Aroclor-1260	6750	ND	0.50	

Surrogate	Code	%REC	Limits
TCMX	8256	67	39-120
Decachlorobiphenyl	3111	74	28-120

Type:	BLANK	Prepared:	02/10/15 15:00
Lab ID:	QC776634	Analyzed:	02/11/15 22:35
Chemist:	AVW		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.50	
Aroclor-1221	6500	ND	1.0	0.32
Aroclor-1232	6550	ND	0.50	
Aroclor-1242	6600	ND	0.50	
Aroclor-1248	6650	ND	0.50	
Aroclor-1254	6700	ND	0.50	
Aroclor-1260	6750	ND	0.50	

Surrogate	Code	%REC	Limits
TCMX	8256	67	39-120
Decachlorobiphenyl	3111	86	28-120

ND= Not Detected
RL= Reporting Limit
MDL= Method Detection Limit

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	264562	Cert #:	CA ELAP# 2896, NELAP# 4044-001
Client:	Lawrence Berkeley National Lab	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8082
Location:	GWMP - Old Town Groundwater PCBs		
Requested:	E8082A	Batch#:	220278
Matrix:	Water	Instrument:	GC16
Units:	ug/L	Chemist:	EAH
Diln Fac:	1.000	Prepared:	02/10/15 15:00

Type: BS Analyzed: 02/11/15 23:03
Lab ID: QC776635

Analyte	Code	Spiked	Result	%REC	Limits
Aroclor-1016	6450	5.000	4.634	93	62-127
Aroclor-1260	6750	5.000	5.276	106	60-135

Surrogate	Code	%REC	Limits
TCMX	8256	70	39-120
Decachlorobiphenyl	3111	97	28-120

Type: BSD Analyzed: 02/11/15 23:31
Lab ID: QC776636

Analyte	Code	Spiked	Result	%REC	Limits	RPD	Lim
Aroclor-1016	6450	5.000	4.735	95	62-127	2	29
Aroclor-1260	6750	5.000	5.120	102	60-135	3	40

Surrogate	Code	%REC	Limits
TCMX	8256	79	39-120
Decachlorobiphenyl	3111	96	28-120

RPD= Relative Percent Difference


Curtis & Tompkins, Ltd.
Analytical Laboratories, Since 1878

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 264626
ANALYTICAL REPORT

Lawrence Berkeley National Lab	Project : STANDARD
1 Cyclotron Road	Location : GWMP - Old Town GW Sampling in PCBs
Berkeley, CA 94720	Level : II

Sample ID	Lab ID
75180	264626-001
75181	264626-002
75182	264626-003
75183	264626-004
75184	264626-005
75185	264626-006
75186	264626-007
75188	264626-008
75189	264626-009
75193	264626-010
75194	264626-011
75195	264626-012

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: Isabelle Choy   Date: 02/20/2015

Isabelle Choy
Project Manager
isabelle.choy@ctberk.com

CA ELAP# 2896, NELAP# 4044-001

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**264626**
Client:	**Lawrence Berkeley National Lab**
Location:	**GWMP - Old Town GW Sampling in PCBs**
Request Date:	**02/12/15**
Samples Received:	**02/12/15**

This data package contains sample and QC results for twelve water samples, requested for the above referenced project on 02/12/15. The samples were received on ice and intact. All holding times and calibration criteria were met.

PCBs (EPA 8082):
All samples underwent sulfuric acid cleanup using EPA Method 3665A. All samples underwent sulfur cleanup using the copper option in EPA Method 3660B. No analytical problems were encountered.

U.C. Lawrence Berkeley National Laboratory
1 Cyclotron Road
Berkeley CA 94720

264626

LBNL ENVIRONMENTAL RESTORATION
Chain of Custody

Send final reports to: Suying Xu, Mailstop 75B0101
Send preliminary results to: Iraj Javandel, e-mail: IJavandel@lbl.gov
Phone: 510-486-6106 **Fax:** 510-486-8694
Purpose: Groundwater Monitoring Program - Old Town Groundwater Sampling in PCBs, Feb 2015

COC No.: 08344

Collection(s): 7698

Page 1 of 1

[redacted]

1	75180	2/11/2015 9:40	2/11/2015 9:40	Aqueous	1 Liter AG	2	None	E8082A	2-15-47
2	75181	2/11/2015 8:20	2/11/2015 8:20	Aqueous	1 Liter AG	2	None	E8082A	2-15-44
3	75182	2/12/2015 8:10	2/12/2015 8:10	Aqueous	1 Liter AG	2	None	E8082A	2-15-55
4	75183	2/12/2015 8:50	2/12/2015 8:50	Aqueous	1 Liter AG	2	None	E8082A	2-15-57
5	75184	2/11/2015 9:00	2/11/2015 9:00	Aqueous	1 Liter AG	2	None	E8082A	2-15-46
6	75185	2/11/2015 11:30	2/11/2015 11:30	Aqueous	1 Liter AG	2	None	E8082A	2-15-49
7	75186	2/12/2015 7:10	2/12/2015 7:10	Aqueous	1 Liter AG	2	None	E8082A	2-15-53
8	75188	2/11/2015 12:35	2/11/2015 12:35	Aqueous	1 Liter AG	2	None	E8082A	2-15-51
9	75189	2/11/2015 8:40	2/11/2015 8:40	Aqueous	1 Liter AG	2	None	E8082A	2-15-45
10	75193	2/12/2015 7:45	2/12/2015 7:45	Aqueous	1 Liter AG	2	None	E8082A	2-15-54
11	75194	2/11/2015 10:10	2/11/2015 10:10	Aqueous	1 Liter AG	2	None	E8082A	2-15-48
12	75195	2/11/2015 12:10	2/11/2015 12:10	Aqueous	1 Liter AG	2	None	E8082A	2-15-50

Total No. of Containers: 24
Shipping Document ID:
Turnaround Time**:** 5 days
Lab Name: CURTISTOMP
Sampled by: JKC/NS

Special Instructions/Comments:
SAMPLES DELIVERED IN ICE CHEST WITH BLUE ICE

Relinquished By (Sampler)	Relinquished By	Relinquished By
Signature: [signature] Time: 13:25	Signature: [signature] Time: 1355	Signature: Time:
Printed Name: JIMMY K CHIU Date: 2/12/15	Printed Name: T. DONOVAN Date: 2/12/15	Printed Name: Date:
Company: LBNL	Company: LBNL	Company:

Received By	Received By	Received By
Signature: [signature] Time: 1325	Signature: [signature] Time: 1355	Signature: Time:
Printed Name: T. DONOVAN Date: 2/12/15	Printed Name: ISABELLE CHAY Date: 2/12/15	Printed Name: Date:
Company: LBNL	Company: CAT	Company:

*REFERENCE DATE/TIME: Use this value for decay calculations in radiological analyses when applicable **Container Codes: AG = amber glass CG = clear glass PE = polyethylene VV = VOA vial

*** Field Sample ID: If present, use this information as the sample identifier in hard-copy reports (please include Sample Location information in the notes). If blank, and in electronic deliverable files, use Sample Location as the identifier. ****Listed turnaround time is for reporting and is in work days, as defined in the Joint LBNL/LLNL Analytical Services blanket order.

COOLER RECEIPT CHECKLIST

Curtis & Tompkins, Ltd.

Login # 264626 Date Received 2/12/15 Number of coolers 2

Client LBNL Project GWNP - Old Town Groundwater Sampling

Date Opened 2/12 By (print) BL (sign) [signature]

Date Logged in ↓ By (print) ↓ (sign) ↓

1. Did cooler come with a shipping slip (airbill, etc) YES NO
   Shipping info

2A. Were custody seals present? .... ☐ YES (circle) on cooler on samples ☒ NO
   How many Name Date

2B. Were custody seals intact upon arrival? YES NO N/A

3. Were custody papers dry and intact when received? YES NO

4. Were custody papers filled out properly (ink, signed, etc)? YES NO

5. Is the project identifiable from custody papers? (If so fill out top of form) YES NO

6. Indicate the packing in cooler: (if other, describe)

☒ Bubble Wrap ☐ Foam blocks ☐ Bags ☐ None
☐ Cloth material ☒ Cardboard ☐ Styrofoam ☐ Paper towels

7. Temperature documentation: * Notify PM if temperature exceeds 6°C

Type of ice used: ☐ Wet ☒ Blue/Gel ☐ None Temp(°C)

☐ Samples Received on ice & cold without a temperature blank; temp. taken with IR gun

☐ Samples received on ice directly from the field. Cooling process had begun

8. Were Method 5035 sampling containers present? YES NO
   If YES, what time were they transferred to freezer?

9. Did all bottles arrive unbroken/unopened? YES NO

10. Are there any missing / extra samples? YES NO

11. Are samples in the appropriate containers for indicated tests? YES NO

12. Are sample labels present, in good condition and complete? YES NO

13. Do the sample labels agree with custody papers? YES NO

14. Was sufficient amount of sample sent for tests requested? YES NO

15. Are the samples appropriately preserved? YES NO N/A

16. Did you check preservatives for all bottles for each sample? YES NO N/A

17. Did you document your preservative check? YES NO N/A

18. Did you change the hold time in LIMS for unpreserved VOAs? YES NO N/A

19. Did you change the hold time in LIMS for preserved terracores? YES NO N/A

20. Are bubbles > 6mm absent in VOA samples? YES NO N/A

21. Was the client contacted concerning this sample delivery? YES NO
   If YES, Who was called? By Date:

COMMENTS

Rev 10, 9/12

Curtis & Tompkins, Ltd.

Detections Summary for 264626

Results for any subcontracted analyses are not included in this summary.

Client : Lawrence Berkeley National Lab
Project : STANDARD
Location : GWMP - Old Town GW Sampling in PCBs

Client Sample ID : 75180 Laboratory Sample ID : 264626-001

No Detections

Client Sample ID : 75181 Laboratory Sample ID : 264626-002

No Detections

Client Sample ID : 75182 Laboratory Sample ID : 264626-003

No Detections

Client Sample ID : 75183 Laboratory Sample ID : 264626-004

No Detections

Client Sample ID : 75184 Laboratory Sample ID : 264626-005

No Detections

Client Sample ID : 75185 Laboratory Sample ID : 264626-006

No Detections

Client Sample ID : 75186 Laboratory Sample ID : 264626-007

No Detections

Client Sample ID : 75188 Laboratory Sample ID : 264626-008

No Detections

Client Sample ID : 75189 Laboratory Sample ID : 264626-009

No Detections

Curtis & Tompkins, Ltd.

Client Sample ID : 75193		Laboratory Sample ID :	264626-010

No Detections

Client Sample ID : 75194		Laboratory Sample ID :	264626-011

No Detections

Client Sample ID : 75195		Laboratory Sample ID :	264626-012

No Detections

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	264626	Cert #:	CA ELAP# 2896, NELAP# 4044-001
Client:	Lawrence Berkeley National Lab	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8082
Location:	GWMP - Old Town GW Sampling in PCBs		
Requested:	E8082A	Batch#:	220501
Matrix:	Water	Received:	02/12/15
Units:	ug/L	Prepared:	02/17/15 14:00
Diln Fac:	1.000		

Field ID:	75180	Chemist:	AVW
Type:	SAMPLE	Sampled:	02/11/15 09:40
Lab ID:	264626-001	Analyzed:	02/19/15 18:55
Instrument:	GC06		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.48	
Aroclor-1221	6500	ND	0.96	0.31
Aroclor-1232	6550	ND	0.48	
Aroclor-1242	6600	ND	0.48	
Aroclor-1248	6650	ND	0.48	
Aroclor-1254	6700	ND	0.48	
Aroclor-1260	6750	ND	0.48	

Surrogate	Code	%REC	Limits
TCMX	8256	68	39-120
Decachlorobiphenyl	3111	89	28-120

Field ID:	75181	Chemist:	AVW
Type:	SAMPLE	Sampled:	02/11/15 08:20
Lab ID:	264626-002	Analyzed:	02/19/15 19:23
Instrument:	GC06		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.48	
Aroclor-1221	6500	ND	0.96	0.31
Aroclor-1232	6550	ND	0.48	
Aroclor-1242	6600	ND	0.48	
Aroclor-1248	6650	ND	0.48	
Aroclor-1254	6700	ND	0.48	
Aroclor-1260	6750	ND	0.48	

Surrogate	Code	%REC	Limits
TCMX	8256	61	39-120
Decachlorobiphenyl	3111	76	28-120

ND= Not Detected
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	264626	Cert #:	CA ELAP# 2896, NELAP# 4044-001
Client:	Lawrence Berkeley National Lab	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8082
Location:	GWMP - Old Town GW Sampling in PCBs		
Requested:	E8082A	Batch#:	220501
Matrix:	Water	Received:	02/12/15
Units:	ug/L	Prepared:	02/17/15 14:00
Diln Fac:	1.000		

Field ID:	75182	Chemist:	AVW
Type:	SAMPLE	Sampled:	02/12/15 08:10
Lab ID:	264626-003	Analyzed:	02/19/15 19:50
Instrument:	GC06		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.48	
Aroclor-1221	6500	ND	0.96	0.31
Aroclor-1232	6550	ND	0.48	
Aroclor-1242	6600	ND	0.48	
Aroclor-1248	6650	ND	0.48	
Aroclor-1254	6700	ND	0.48	
Aroclor-1260	6750	ND	0.48	

Surrogate	Code	%REC	Limits
TCMX	8256	65	39-120
Decachlorobiphenyl	3111	83	28-120

Field ID:	75183	Chemist:	AVW
Type:	SAMPLE	Sampled:	02/12/15 08:50
Lab ID:	264626-004	Analyzed:	02/19/15 20:18
Instrument:	GC06		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.48	
Aroclor-1221	6500	ND	0.96	0.31
Aroclor-1232	6550	ND	0.48	
Aroclor-1242	6600	ND	0.48	
Aroclor-1248	6650	ND	0.48	
Aroclor-1254	6700	ND	0.48	
Aroclor-1260	6750	ND	0.48	

Surrogate	Code	%REC	Limits
TCMX	8256	41	39-120
Decachlorobiphenyl	3111	39	28-120

ND= Not Detected
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	264626	Cert #:	CA ELAP# 2896, NELAP# 4044-001
Client:	Lawrence Berkeley National Lab	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8082
Location:	GWMP - Old Town GW Sampling in PCBs		
Requested:	E8082A	Batch#:	220501
Matrix:	Water	Received:	02/12/15
Units:	ug/L	Prepared:	02/17/15 14:00
Diln Fac:	1.000		

Field ID:	75184	Chemist:	AVW
Type:	SAMPLE	Sampled:	02/11/15 09:00
Lab ID:	264626-005	Analyzed:	02/19/15 20:45
Instrument:	GC06		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.48	
Aroclor-1221	6500	ND	0.96	0.31
Aroclor-1232	6550	ND	0.48	
Aroclor-1242	6600	ND	0.48	
Aroclor-1248	6650	ND	0.48	
Aroclor-1254	6700	ND	0.48	
Aroclor-1260	6750	ND	0.48	

Surrogate	Code	%REC	Limits
TCMX	8256	56	39-120
Decachlorobiphenyl	3111	68	28-120

Field ID:	75185	Chemist:	AVW
Type:	SAMPLE	Sampled:	02/11/15 11:30
Lab ID:	264626-006	Analyzed:	02/19/15 21:13
Instrument:	GC06		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.48	
Aroclor-1221	6500	ND	0.96	0.31
Aroclor-1232	6550	ND	0.48	
Aroclor-1242	6600	ND	0.48	
Aroclor-1248	6650	ND	0.48	
Aroclor-1254	6700	ND	0.48	
Aroclor-1260	6750	ND	0.48	

Surrogate	Code	%REC	Limits
TCMX	8256	56	39-120
Decachlorobiphenyl	3111	65	28-120

ND= Not Detected
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	264626	Cert #:	CA ELAP# 2896, NELAP# 4044-001
Client:	Lawrence Berkeley National Lab	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8082
Location:	GWMP - Old Town GW Sampling in PCBs		
Requested:	E8082A	Batch#:	220501
Matrix:	Water	Received:	02/12/15
Units:	ug/L	Prepared:	02/17/15 14:00
Diln Fac:	1.000		

Field ID:	75186	Chemist:	AVW
Type:	SAMPLE	Sampled:	02/12/15 07:10
Lab ID:	264626-007	Analyzed:	02/19/15 21:40
Instrument:	GC06		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.48	
Aroclor-1221	6500	ND	0.96	0.31
Aroclor-1232	6550	ND	0.48	
Aroclor-1242	6600	ND	0.48	
Aroclor-1248	6650	ND	0.48	
Aroclor-1254	6700	ND	0.48	
Aroclor-1260	6750	ND	0.48	

Surrogate	Code	%REC	Limits
TCMX	8256	60	39-120
Decachlorobiphenyl	3111	63	28-120

Field ID:	75188	Chemist:	AVW
Type:	SAMPLE	Sampled:	02/11/15 12:35
Lab ID:	264626-008	Analyzed:	02/19/15 22:08
Instrument:	GC06		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.48	
Aroclor-1221	6500	ND	0.96	0.31
Aroclor-1232	6550	ND	0.48	
Aroclor-1242	6600	ND	0.48	
Aroclor-1248	6650	ND	0.48	
Aroclor-1254	6700	ND	0.48	
Aroclor-1260	6750	ND	0.48	

Surrogate	Code	%REC	Limits
TCMX	8256	60	39-120
Decachlorobiphenyl	3111	74	28-120

ND= Not Detected
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	264626	Cert #:	CA ELAP# 2896, NELAP# 4044-001
Client:	Lawrence Berkeley National Lab	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8082
Location:	GWMP - Old Town GW Sampling in PCBs		

Requested:	E8082A	Batch#:	220501
Matrix:	Water	Received:	02/12/15
Units:	ug/L	Prepared:	02/17/15 14:00
Diln Fac:	1.000		

Field ID:	75189	Chemist:	AVW
Type:	SAMPLE	Sampled:	02/11/15 08:40
Lab ID:	264626-009	Analyzed:	02/19/15 22:35
Instrument:	GC06		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.48	
Aroclor-1221	6500	ND	0.96	0.31
Aroclor-1232	6550	ND	0.48	
Aroclor-1242	6600	ND	0.48	
Aroclor-1248	6650	ND	0.48	
Aroclor-1254	6700	ND	0.48	
Aroclor-1260	6750	ND	0.48	

Surrogate	Code	%REC	Limits
TCMX	8256	70	39-120
Decachlorobiphenyl	3111	75	28-120

Field ID:	75193	Chemist:	AVW
Type:	SAMPLE	Sampled:	02/12/15 07:45
Lab ID:	264626-010	Analyzed:	02/19/15 23:03
Instrument:	GC06		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.48	
Aroclor-1221	6500	ND	0.96	0.31
Aroclor-1232	6550	ND	0.48	
Aroclor-1242	6600	ND	0.48	
Aroclor-1248	6650	ND	0.48	
Aroclor-1254	6700	ND	0.48	
Aroclor-1260	6750	ND	0.48	

Surrogate	Code	%REC	Limits
TCMX	8256	82	39-120
Decachlorobiphenyl	3111	91	28-120

ND= Not Detected
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	264626	Cert #:	CA ELAP# 2896, NELAP# 4044-001
Client:	Lawrence Berkeley National Lab	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8082
Location:	GWMP - Old Town GW Sampling in PCBs		
Requested:	E8082A	Batch#:	220501
Matrix:	Water	Received:	02/12/15
Units:	ug/L	Prepared:	02/17/15 14:00
Diln Fac:	1.000		

Field ID:	75194	Chemist:	ICK
Type:	SAMPLE	Sampled:	02/11/15 10:10
Lab ID:	264626-011	Analyzed:	02/19/15 20:26
Instrument:	GC16		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.48	
Aroclor-1221	6500	ND	0.96	0.31
Aroclor-1232	6550	ND	0.48	
Aroclor-1242	6600	ND	0.48	
Aroclor-1248	6650	ND	0.48	
Aroclor-1254	6700	ND	0.48	
Aroclor-1260	6750	ND	0.48	

Surrogate	Code	%REC	Limits
TCMX	8256	71	39-120
Decachlorobiphenyl	3111	87	28-120

Field ID:	75195	Chemist:	ICK
Type:	SAMPLE	Sampled:	02/11/15 12:10
Lab ID:	264626-012	Analyzed:	02/19/15 20:54
Instrument:	GC16		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.48	
Aroclor-1221	6500	ND	0.96	0.31
Aroclor-1232	6550	ND	0.48	
Aroclor-1242	6600	ND	0.48	
Aroclor-1248	6650	ND	0.48	
Aroclor-1254	6700	ND	0.48	
Aroclor-1260	6750	ND	0.48	

Surrogate	Code	%REC	Limits
TCMX	8256	59	39-120
Decachlorobiphenyl	3111	70	28-120

ND= Not Detected
RL= Reporting Limit
MDL= Method Detection Limit

Curtis & Tompkins, Ltd.

Polychlorinated Biphenyls (PCBs)

Lab #:	264626	Cert #:	CA ELAP# 2896, NELAP# 4044-001
Client:	Lawrence Berkeley National Lab	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8082
Location:	GWMP - Old Town GW Sampling in PCBs		
Requested:	E8082A	Batch#:	220501
Matrix:	Water	Received:	02/12/15
Units:	ug/L	Prepared:	02/17/15 14:00
Diln Fac:	1.000		

Type:	BLANK	Chemist:	ICK
Lab ID:	QC777507	Analyzed:	02/19/15 23:30
Instrument:	GC06		

Analyte	Code	Result	RL	MDL
Aroclor-1016	6450	ND	0.50	
Aroclor-1221	6500	ND	1.0	0.32
Aroclor-1232	6550	ND	0.50	
Aroclor-1242	6600	ND	0.50	
Aroclor-1248	6650	ND	0.50	
Aroclor-1254	6700	ND	0.50	
Aroclor-1260	6750	ND	0.50	

Surrogate	Code	%REC	Limits
TCMX	8256	62	39-120
Decachlorobiphenyl	3111	88	28-120

ND= Not Detected
RL= Reporting Limit
MDL= Method Detection Limit

Batch QC Report

Polychlorinated Biphenyls (PCBs)

Lab #:	264626	Cert #:	CA ELAP# 2896, NELAP# 4044-001
Client:	Lawrence Berkeley National Lab	Prep:	EPA 3520C
Project#:	STANDARD	Analysis:	EPA 8082
Location:	GWMP - Old Town GW Sampling in PCBs		
Requested:	E8082A	Batch#:	220501
Matrix:	Water	Instrument:	GC06
Units:	ug/L	Chemist:	ICK
Diln Fac:	1.000		

Type: BS
Lab ID: QC777508
Prepared: 02/17/15 14:00
Analyzed: 02/19/15 23:57

Analyte	Code	Spiked	Result	%REC	Limits
Aroclor-1016	6450	5.000	3.822	76	62-127
Aroclor-1260	6750	5.000	3.483	70	60-135

Surrogate	Code	%REC	Limits
TCMX	8256	61	39-120
Decachlorobiphenyl	3111	72	28-120

Type: BSD
Lab ID: QC777509
Prepared: 02/18/15 13:13
Analyzed: 02/20/15 00:25

Analyte	Code	Spiked	Result	%REC	Limits	RPD	Lim
Aroclor-1016	6450	5.000	5.028	101	62-127	27	29
Aroclor-1260	6750	5.000	4.141	83	60-135	17	40

Surrogate	Code	%REC	Limits
TCMX	8256	89	39-120
Decachlorobiphenyl	3111	95	28-120

RPD= Relative Percent Difference

Appendix E. Standard Operating Procedure for Wipe Sampling

WIPE SAMPLING AND DOUBLE WASH/RINSE CLEANUP

AS RECOMMENDED BY

THE ENVIRONMENTAL PROTECTION AGENCY PCB SPILL CLEANUP POLICY

June 23, 1987

Revised and Clarified on April 18, 1991

Written By:

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Chemical Regulation Branch
United States Environmental Protection Agency
Washington, D.C.

CONTENTS

I. WIPE SAMPLING ACCORDING TO THE PCB SPILL CLEANUP POLICY

Introduction:

This document was prepared following the publication of the PCB Spill Cleanup Policy in the Federal Register on April 2, 1987. The procedures were demonstrated by EPA PCB program technical staff at PCB Forum '87 and PCB Forum '88. These PCB forums were privately sponsored seminars discussing the requirements of the recently issued PCB Spill Cleanup Policy. The seminars were publicly announced and held in eight cities near the EPA Regional Offices.

The revisions and clarifications to the document include the addition of an Introduction heading, the addition of three paragraphs to the Background heading, and the amendment to item 4 in "An Example of a Wipe Sampling Procedure."

This document was revised and clarified because it did not clearly and completely state EPA's intentions in an area where details were essential, that is the original version of this document assumed that a gloved hand would apply the gauze with moderate pressure, but inadvertently this requirement was never explicitly stated in the example of the wipe sampling procedure. The gloved-hand application of the gauze might have been assumed since the gloves were to be discarded after each sample. The procedure clearly did not say to apply the gauze to the surface with forceps. The EPA demonstrations and discussions at the PCB Forums clearly emphasized the pressurized application of moistened cotton gauze to the surface with a gloved hand.

Background:

The PCB spill Cleanup Policy requires wipe sampling for the determination of surface levels of PCBs resulting from PCB spills onto hard, "smooth", surfaces such as metal, wood, concrete, plastic, and glass (see Tables 1 and 2). There are several activities surrounding a PCB spill cleanup where wipe sampling may be used: (a) site characterization; (b) interim evaluation of the progress of the cleanup; and (c) the final process to verify that the cleanup has met requirements of the PCB Spill Cleanup Policy.

Wipe sampling has a number of advantages. The most apparent advantage is that wipe sampling is probably the best way to determine smooth "impervious" surface concentrations. Wipe sampling is most effective in areas with relatively large, flat, easily accessible surfaces where an accidental and/or short time exposure to PCBs has occurred. The surfaces which are sampled by wipe sampling in many cases will have been (or will be) cleaned by wiping or wiping-related activities.

Wipe sampling is best used in conjunction with statistical random sampling and/or area sampling techniques. Reduction in sampling errors for all kinds of sampling procedures can be accomplished by statistical selection of the smaller sampling sites selected to represent a larger area. Non-sampling errors may be reduced by maintaining consistency within the sampling activities; use of comprehensive quality control procedures and samples; and wherever possible, establishing a reference point for comparison.

Unfortunately, wipe sampling is not quantitative because of the fairly large variability in several component parts of sampling and the relative inefficiency of extraction of the analyte of interest from the wipes. Wipe sampling evaluation study results are known to vary widely, for example, when the same sampling is done (1) by different samplers; (2) on similarly contaminated surfaces having different textures or porosities; (3) using no solvent or solvents having different polarities; and (4) using different kinds of wiping material such as filter paper or cotton gauze.

When a decision is made to use wipe sampling, (1) it should be assumed that the results are not always reproducible; (2) extra care should be used to minimize the variability and optimize quantitation; and (3) even if representative sampling is employed, wipe sampling results can indicate residual levels substantially below true surface levels. In developing the PCB Spill Cleanup Policy, EPA has considered the advantages and disadvantages of wipe sampling and accordingly has established allowable residual PCB levels as measured by wipe sampling.

Since the objective of surface sampling is to remove PCB liquids and particles, which may be adhering to the surface, from the surface an aggressive sampling procedure is necessary. The aggressive sampling is appropriate since often the surfaces being samples have been aggressively cleaned and may drive residual PCBs into the surface. For determining the PCB surface concentrations on smooth surfaces, EPA recommends wipe sampling using cotton gauze as the wipe medium and using a gloved or doubly gloved hand to apply the wipe to the surface. This procedure requires changing into new/clean gloves between samples. EPA recognizes that there may be some transport of PCBs from the gauze to the surface of the gloves. However, this potential loss is considered more acceptable than the problems from the disadvantages of other wipe sampling procedures.

Procedures employing filter paper and/or glass fiber pads and application of these pads to surfaces by swabbing, dipping, or brushing with a pair of forceps are unacceptable. EPA recognizes that this kind of wipe sampling technique may be widely applied to address other kinds of surface sampling objectives. However, to meet EPA's PCB surface sampling objectives, these procedures are less efficient and less effective than hand wiping with the more absorbent cotton gauze.

Any compositing of wipe samples or sampling of areas larger than 100 cm² may not address the intent of PCB Spill Cleanup Policy verification sampling.

Answers to Questions on Wipe Sampling Procedures:

Why is does it take so much care to wipe sample correctly?

There is a considerable variability possible among wipe sampling results due to (a) the sampling technique of the sampler and (b) the efficiencies of removing PCBs from several matrices and placing the PCBs into several other matrices. Therefore it is important to reduce this variability to the maximum extent possible, so that in the event of a verification analysis by quality control samplers or government enforcement inspectors, similar wipe sampling results will be obtained for a clean site.

Two factors increase the probability of reducing errors introduced by the sampler's technique: consistency and quality control. Consistency is aided by proper training, easily understood sampling procedures, immediate availability of proper supplies, and whenever possible, using the same sampler to do all sampling at a particular site. Quality control procedures provide reference points and comparisons for the field sample results. When the analytical results from quality control samples indicate potential sampling and analysis problems, there is often sufficient time to reexamine field results. Quality control sampling can reduce or eliminate additional sampling and analysis start up and/or additional cleanup costs.

The reproducibility and efficiency of transferring residual PCBs from one place to another require that such residual PCBs must have a much greater affinity to partition, in one or more steps, from the place of origin to the ultimate destination. For all transfer steps, PCBs must exhibit a much greater propensity to be in the destination medium than in the medium of origin. There are several transfer steps in the process which starts from the removal of PCBs from the surface sampled and ends with the production of a PCB surface concentration by way of instrumental analysis.

The first of these transfer steps is removing residual PCBs from the surface to be sampled and transferring them into the sampling medium*. Gauze pads are sturdier, allow better surface to surface contact, and absorb more solvent (and more PCBs) than filter paper. Therefore, gauze pads are the absorbent/sampling medium of choice. Since PCBs are very soluble in organic solvents, organic solvent is used to moisten the gauze pads to ease the transport of PCBs from the sampled surface into the sampling media. Once the areas of where the spill occurred have been sampled (after cleanup) and the residual PCBs have been transported to the moistened gauze, then the gauze is air dried and stored/shipped for chemical analysis. The gauze is dried so as to facilitate transfer by organic solvent from the gauze to another medium during the laboratory extraction step.

In the extraction step the PCBs must be isolated from the gauze in a form amenable to the chemical analysis methods to be used. The PCBs now in the gauze are usually extracted into a solvent by repeated rinsing with and subsequent collection of organic solvent. The extraction solvent is removed from the PCBs by evaporation of the solvent prior to chemical analysis. The more volatile organic solvent evaporates and leaves the less volatile PCBs in a more concentrated solution for further treatment or instrumental analysis.

What is the best way to wipe sample for PCBs on smooth surfaces?

There are several steps in a wipe sampling procedure. The first step is to prepare the sampler for the sampling activity. The sampler may have to be advised of (through a briefing or a refresher course), or trained in, the objectives of the sampling program and the procedures to be used to accomplish those objectives.

Once advised of the objectives and sampling procedures, the sampler must either prepare or obtain the sampling plan and sampling materials. The sampler must know the exact sampling sites or know the exact procedure for selecting those sites. The sampling supplies must be sufficient in quantity and quality for all normally expected occurrences. Provisions should be also made for quality assurance samples, chain of custody forms, and shipping materials for storage.

* When PCB-contaminated office paper has been solvent rinsed, then wipe sampled and bulk sampled, some recent chemical analysis results indicate that the PCB concentration in the surface wipes is not the same as the concentration in the bulk samples. PCB levels in uncontaminated paper were used as a control. The difference in PCB levels in the wipe samples and bulk samples may

be explained by PCB migration into the paper either during cleanup to remove PCBs or during the wipe sampling step.

An important series of quality assurance measures taken before on-site sampling occurs may save considerable expense from collecting contaminated or unusable wipe samples. Sampler training can include practice sampling of surfaces spiked with PCB surrogate compounds, such as tri- and tetrachlorobenzenes to sharpen skills (a) in wiping thoroughly and consistently, and (b) avoiding cross contamination. In addition, before field sampling is conducted, method blanks can be used to verify that sampling equipment supplies and procedures do not introduce PCBs or analytical interferences to the wipe samples. Complete supplies for sampling should be cleaned, a fraction of the supplies sampled individually or through method blanks, and, if clean, the supplies should be protected against contamination or destruction while being transported to the sampling site and while at the sampling site before actual sampling occurs.

The sampler arrives at a sampling site and determines the exact location where the 100 square centimeter (cm^2) sample will be taken. The sample location may be marked or framed by a template. The sampler must be conscious of possibility of cross contamination during all stages of the sampling activity. All surfaces should be wiped with as uniform a pressure as possible. It is important to use the appropriate pressure to thoroughly wipe materials off the surface. Wiping proceeds from left to right in rows from the top to the bottom of the framed sampling area. The sampling area is wiped again with the same uniform pressure in columns from the top to the bottom from the left side to the right side of the entire framed area. It is not critical whether wiping starts at the top left or with rows first and then columns. The objective is to systematically, thoroughly, and consistently wipe the entire framed area twice, each time from a different direction and orientation.

Once the area has been wiped, the sampling gauze is allowed to air dry and is replaced in the sample vial. The sample vial is then labelled, the chain of custody filled out, and the sample prepared/stored for shipping.

Table 1

SUMMARY OF CLEANUP LEVELS BASED ON THE EPA PCB SPILL CLEANUP POLICY

Requirements for Cleanup of Low-Concentration Spills Which Involve Less Than One Pound PCBs by Weight (Less Than 270 Gallons of Untested Mineral Oil [Containing Less Than 500 ppm PCBs])

Solid Surfaces (except for all indoor, residential surfaces other than vault areas)	Double washed/rinsed
All Indoor, Residential Surfaces Other Than Vault Areas	10 micrograms per 100 cm^2 by standard commercial wipe tests
Soil	Remove visible traces of the spill and soil within a one foot buffer of the visible traces

Table 2

SUMMARY OF CLEANUP LEVELS
BASED ON THE EPA PCB SPILL CLEANUP POLICY

Requirements for Cleanup of
High-Concentration Spills and Low-Concentration Spills
Involving One Pound or More PCBs by Weight
(270 Gallons or More of Untested Mineral Oil
[Containing Less Than 500 ppm PCBs])

Residential/Commercial/Rural	
Indoor (except vaults), and Outdoor High Contact	10 micrograms per 100 cm^2
Indoor Vaults	10 micrograms per 100 cm^2
Outdoor Low Contact	10 micrograms per 100 cm^2
Porous Surface Option	100 micrograms per 100 cm^2 plus encapsulation
Soil	10 ppm Plus a 10 Inch Cap
Restricted Access (Non-Sub-Station)	
High Contact Surfaces	10 micrograms per 100 cm^2
Low Contact Indoor Surfaces	10 micrograms per 100 cm^2
Porous Surface Option	100 micrograms per 100 cm^2 Plus Encapsulation
Outdoor Low Contact Surfaces	100 micrograms per 100 cm^2
Soil	25 ppm
Outdoor Electrical Substations	
Surfaces	100 micrograms per 100 cm^2

Soil	25 ppm or 50 ppm with Notice

Additional Wipe Sampling Information
(Contents)

1. An Example of a List of Wipe Sampling Supplies.
2. An Example of Sample Site Preparations.
3. An Example of a Wipe Sampling Procedure.
4. A Detailed Description of Quality Controls for Wipe Sampling Activities.
5. Wipe Sampling Quality Control Samples (Summary).
6. An Example of Quality Assurance Procedures Useful When Conducting Wipe Sampling Activities.
7. An Example of Procedures to Use When Cleaning Wipe Sampling Equipment.

An Example of a List of Wipe Sampling Supplies

Copy of Sampling Procedures and Study Objectives

Pen (Indelible Ink)

Pre-numbered Sample Labels

Tape to Cover Labels

Chain of Custody Forms

Screw Top Vials with Teflon Lined Caps
These Vials Contain Pre-Cleaned 3" x 3" Surgical Gauze Pads

Teflon Squirt Bottle for Applying Solvent to Wipes and Washing

Solvent, preferably in a bottle with a volumetric delivery top

Graduated cylinder, when not using a volumetric delivery top

Disposable Gloves

Metal Ruler

Sampling Template

Forceps for Removing (Replacing) Gauze from (into) Vials

Disposable Wipes (for cleaning ruler)

Garbage Bags/Containers (for disposal of gloves and solid waste)

Funnel

Five Gallon Solvent Can for Disposal of Rinse Solvent

Shipping/Storage Containers for Samples

Sampling Site Description Forms with Optional Instant Print Camera

An Example of Sample Site Preparations

At each sample site location:

- Mark the exact sample site with the template or a ruler

- If the site is not easily marked with a template or ruler (an irregular non-planar surface), write a detailed description of the area sampled. A instant print photograph with the ruler included (for scale) is a very valuable descriptor.

- Prepare all necessary forms and sampling logs for entry of the sampling time, date, location, and other information describing the sampling at that particular site.

- Prepare all sampling equipment for sampling the site.

An Example of a Wipe Sampling Procedure

Assume that the exact sampling site has been marked.

1. With gloved hands, remove the cap from the sampling vial.

2. With the forceps, remove the gauze from the sampling vial.

3. From a solvent bottle, use the volumetric delivery device or fill a graduated cylinder with 5 milliliters of solvent to the gauze.

4. Immediately begin applying the gauze using a gloved hand and, applying pressure, wipe the marked area completely twice, from left to right and then from top to bottom.

5. Let the gauze air dry.

6. Fold the dry gauze (sampled side inward) and return it to the sample vial.

7. Cap the sample vial.

8. Remove and discard the gloves.

9. Label the vial and fill out sampling details on the sampling forms.

10. Fill out chain of custody forms and prepare the sample for storage and shipping.

A Detailed Description of Quality Controls for Wipe Sampling Activities

Several kinds of quality control (QC) samples should be used. Each kind of sample provides an indication of the reliability of a part of the sampling and analysis process.

It is better not to identify QC samples as such when submitting the QC samples to the analytical laboratory. It is best to randomly number all samples when submitting them to the analytical laboratory. The chemical analysis laboratory does not need to know sample descriptions except for matrix type or in the event of the presence of an unusually high concentration in the wipe. Specific identification of the QC samples will not be necessary since the concentration range in these samples should be in the normal operating range of the analytical instruments.

Vials refer to the glass vials containing sampling gauze.

1. Field Blanks - at least 5% of the total samples include at least two samples each from the following:

    a. Ship unopened vials back for analysis.

    b. With gloved hands, remove the cap from a sample vial for the estimated time (record this time) of normal wipe sampling, allow the gauze to air dry without applying it to any surface, and proceed with step 7 in the wipe sampling procedure.

    c. Use the wipe sampling procedures to wipe some areas/surfaces near the sampling site but which are not expected to be contaminated.

2. Duplicates - at least 5% of total samples including at a minimum the designated samples from both the following groups:

    a. Double wipe at least two sample sites, label which was the first wipe and which was the second wipe for each of the two sites, for each kind of surface sampled.

    b. For at least two sample sites for each kind of surface sampled, wipe two adjacent identical or nearly identical areas. Clearly identify the samples as being adjacent to one another in the sample description forms.

A Detailed Description of
Quality Controls for Wipe Sampling Activities
(Continued)

3. Field Spikes - at least 5% of total samples including at a minimum the designated samples from each of the following groups for each kind of surface sampled. Clearly describe these samples on the sample description forms.

   a. For two vials or more, remove each gauze and moisten as for sampling and spike each wet gauze with ten micrograms each of the kind of PCBs which was spilled, wipe a contaminated surface adjacent to a sampled surface as in 2b (above), let the gauze air dry, replace the gauze, and proceed with step 7 in the wipe sampling procedure.

   b. For a second pair of vials or more, remove each gauze and moisten as for sampling, wipe a contaminated surface adjacent to a sampled surface as in 2b (above), after wipe sampling (but before air drying) spike each wet gauze with ten micrograms each of the kind of PCBs which was spilled, let the gauze air dry, replace the gauze in the vials, and proceed with step 7 in the wipe sampling procedure.

   c. For a third pair of vials or more, spike sampling surfaces adjacent to another sampled surface as in 2b (above) with ten micrograms each of the kind of PCBs which was spilled and allow to air dry; remove each gauze and moisten as for sampling; wipe the surface; let the gauze air dry, replace the gauze in the vials; and proceed with step 7 in the wipe sampling procedure.

Wipe Sampling Quality Control Samples (Summary)

1. Field Blanks - At least two samples from each category

    a. For each spill site prepare the following blanks:

        i. Unopened sampling vials containing gauze

        ii. Remove gauze but do not use to wipe

    b. For each kind of surface, wipe an uncontaminated 100 cm^2 surface with a gauze as a blank surface

2. Duplicate Samples - At least 5% of total samples

    a. For each kind of surface at each spill site:

        i. Double wipe at least two sample sites

        ii. Side by side wipe at least two sample sites

3. Spiked Samples - At least 5% of total samples

    a. Wipe no less than two samples each for each kind of surface at each spill site. All are side by side paired samples. One sample for each pair is untreated, for the other sample:

        i. Spike gauze with 10 micrograms of PCBs, then wipe the 100 cm^2 area

        ii. Wipe the 100 cm^2 area first, then spike gauze with 10 micrograms of PCBs

        iii. Spike the 100 cm^2 site with 10 micrograms of PCBs, then wipe

An Example of Quality Assurance Procedures Useful When Conducting Wipe Sampling Activities

1. Designate a person, not the sampler or chemical analyst, who is responsible for quality assurance and quality control including: training, preparation of sampling supplies, wipe sampling, sample preparation/extraction, chemical analysis, analytical data reduction, reporting of the sampling results, and conclusions drawn from the results.

2. Document the objectives of the wipe sampling and subsequent chemical analysis. Include performance requirements such as number of samples required, precision, accuracy, measurable deliverables, and schedules.

3. Develop a quality assurance plan which includes: the objectives; quality assurance/quality control procedures, audits, and schedules; persons responsible for all aspects of the sampling and chemical analysis efforts; references to all safety, training, sampling, and chemical analysis procedures; and corrective actions (including approximate times before corrective actions will occur) to be taken in the event that documented procedures cannot be or have not been followed.

4. Verify that staff doing sampling are the designated staff or suitably trained and informed replacements for the designated staff.

5. Verify that the sampling equipment and the sample gauze/vials are not going to introduce contamination into the samples.

6. Verify that sufficient quality control samples are taken and taken properly, that sampling objectives are met, and that chain of custody procedures are being followed.

7. Verify that sample extraction and chemical analysis occurs according to documented procedures. Assure that suitable and sufficient analytical quality control samples and reference standards are analyzed.

8. Verify that analytical data calculations are properly generated and the data are correctly associated with the proper samples.

9. Assure that conclusions based on the chemical analysis of the samples are in keeping with the sampling procedures and sample site locations.

10. Document quality assurance activities including: who did it, what was done, when it was done, where was it done, and why was it

done. Document and justify any deviations from documented procedures and policies.

An Example of Procedures to Use When Cleaning Wipe Sampling Equipment

1. Using clean (or cleaned) disposable equipment is overall probably more cost-effective than cleaning and verifying that cleaned sampling equipment is free from PCBs. The second choice is not cleaning any equipment on or near the sampling site, but to have sufficient recleaned sampling equipment to completely sample a site. The least favorable situation is to clean sampling equipment for reuse at the same sampling site. If cleaning must be done at or near the sampling site, clean the sampling equipment as far from the actual site of cleanup/contaminations as possible.

2. Try to have sufficient clean materials on-site to completely sample a site (plus at least ten percent surplus for unforeseen accidents and blunders) so as not to have to clean any sampling equipment.

3. Use cleaning procedures which have been verified as effective previously. Good cleaning includes:

Washing with soapy water
Rinsing thoroughly with water
Rinsing three times thoroughly with distilled water
Rinsing with PCB-free organic solvent
Air drying for non-glass
Drying in a muffle furnace at 350°C for glass
Verification sampling and analysis of cleaned equipment
Protective packaging for shipment to the sampling site

4. The same kind of verification procedures should be used for new equipment as is used for equipment which has been cleaned:

a. Selecting a statistical sample from the equipment. For lots having large numbers of units (such as sample bottles), a 5% or less proportion of the units may be sufficient. For equipment which comes in direct contact with contaminated surfaces (such as templates) a 10% sample may be more appropriate unless historical data have verified that a smaller proportion is sufficient.

b. Rinsing "clean", dry equipment with the same amount of organic solvent as is used in the sampling procedure or more than sufficient solvent to completely cover and rinse off all contact (with the wipe sample, sampler, or the surface) surfaces of equipment. The rinseate is collected and treated as an extract from a sample gauze pad.

c. The presence of detectable levels of PCBs indicate that contamination is present and that the lot from which the verification sample(s) came must be either recleaned and reverified or disposed of appropriately.

II. DESCRIPTION OF DOUBLE WASH/RINSE

Introduction

The PCB Spill Cleanup Policy requires that low concentration spills of small amounts of PCBs on surfaces are to be removed by a double wash/rinse procedure. The objectives of the double wash/rinse are (1) to recognize the lesser hazard resulting from these small quantity spills and from the cleanup of such spills, and (2) to remove the easily removable PCB material thoroughly and quickly. It is also important not to redistribute PCBs or leave pieces of cleanup materials as a result of the cleanup procedure.

General Requirements for All Double Wash/Rinse Surfaces

For spills where there is still visible PCB-containing liquid present on the surface to be cleaned up, the double wash/rinse procedure first requires a pre-cleaning step. This step includes thoroughly wiping/mopping up the entire surface with absorbent paper or cloth material, such that there are no longer visible signs of the liquid present on the surface.

The double wash/rinse procedure called for in the cleanup of surfaces contaminated by small spills includes the two washing steps and two rinsing steps. The two washing and rinsing steps are slightly different depending on: (a) whether a contaminated surface was relatively clean before the spill, or (b) whether a surface was coated/covered with some sort of absorbent material, such as dust, dirt, grime, or grease.

Minimization of residual PCBs following the double wash/rinse procedure is facilitated by the proper selection and use of cleanup equipment. Scrubbers and the absorbent pads used in the double wash/rinse procedure shall not be dissolved by solvents or cleaners used. Scrubbers and absorbent pads shall not contain greater than 2 parts per million (weight per weight) PCBs. Washing scrubbers and absorbent pads shall not be reused. Rinsing scrubbers and absorbent pads may be reused as washing scrubbers or absorbent pads if necessary, but this is not recommended. All double wash/rinse cleaning/absorbent materials must remain intact (i.e. do not shred, crumble, or leave visible fragments on the surface) after the double wash/rinse operation.

During the double wash/rinse process, all washing and rinsing liquids/solvents must be contained, captured, and properly disposed of in accordance with local, state, and Federal regulations. Following use in the double wash/rinse process, all double wash/rinse equipment and absorbent materials must also be disposed of in accordance with local state, and Federal regulations.

Summary of The Double Wash/Rinse Procedure

General

1. Use disposable cleaning materials which do not

   - dissolve or break apart
   - contain traces of PCBs.

2. Remove any visible PCB liquid before washing/rinsing.

3. Capture and contain washing/rinsing solutions.

4. Properly dispose of cleaning materials and solutions/liquids.

Specific

1. For surfaces not covered with dirt, dust, grime, grease or other potential absorbent of PCBs:

   WASH 1: Scrub with organic solvent and wipe up the solvent.

   RINSE 1: Wipe surface with moistened pad, wipe up with dry pad.

   WASH 2: Repeat WASH 1.

   RINSE 2: Repeat RINSE 1.

2. For surfaces covered with dirt, dust, grime, grease or other potential absorbent of PCBs:

   WASH 1: Scrub with detergent and water, dry.

   RINSE 1: Rinse with water, wipe with wet adsorbent pad, dry.

   WASH 2: Scrub with organic solvent and wipe up the solvent.

   RINSE 2: Wipe surface with moistened pad, wipe up with dry pad.

Detailed Requirements for the Double Wash/Rinse

1. Specific requirements for surfaces that do not appear dusty or grimy before a spill, such as glass, automobile surfaces, newly poured concrete, and desk tops:

WASH 1.

If there is no visible liquid or after having removed the visible liquid, cover the entire surface with organic solvent in which PCBs are soluble to at least 5% by weight. Contain and collect any runoff solvent for disposal. Scrub rough surfaces with a scrub brush or disposable scrubbing pad. Add solvent such that the surface is always very wet for one minute per square foot. Wipe smooth surfaces with a solvent-soaked, disposable absorbent pad for one minute per square foot. Any surface less than one square foot shall also be washed for one minute. Wipe, mop, and/or sorb the solvent onto absorbent material until no visible traces of the solvent remain.

RINSE 1.

Wipe the surface with an absorbent pad soaked with the same organic solvent with a solvent-soaked, disposable absorbent pad for one minute per square foot. Any surface less than one square foot shall also be washed for one minute. Immediately wipe/sop up the solvent on the surface with a dry absorbent.

WASH 2.

Repeat WASH 1.

RINSE 2.

Repeat RINSE 1.

<u>Detailed Requirements for the Double Wash/Rinse (Continued)</u>

2. Specific requirements for dirty, dusty, grimy, or greasy surfaces or surfaces having surface coverings of some other kind of sorbant materials (where the spill probably largely sorbed onto the materials on the surface):

<u>WASH 1.</u>

If there is no visible liquid or after having removed the visible liquid, cover the entire surface with concentrated or industrial strength detergent or non-ionic surfactant solution. Contain and collect all cleaning solutions for proper disposal. Scrub rough surfaces with a scrub brush or scrubbing pad, adding cleaning solution such that the surface is always very wet, for one minute per square foot. Wipe smooth surfaces with a cleaning solution-soaked disposable absorbent pad for one minute per square foot. Any surface less than one square foot shall also be washed for one minute. Mop up or absorb the residual cleaner solution and suds with an absorbent pad until the surface appears dry. This cleaning should remove any residual dirt, dust, grime, or other sorbant materials left on the surface following step one (above).

<u>RINSE 1.</u>

Rinse off the wash solution with one gallon of water per square foot and capture the rinse water. Mop up the wet surface until the surface appears dry.

<u>WASH 2.</u>

Next, cover the entire dry surface with organic solvent in which PCBs are soluble to at least 5% by weight. Scrub rough surfaces with a scrub brush or scrubbing pad adding solvent such that the surface is always very wet for one minute per square foot. Wipe smooth surfaces with a solvent-soaked, disposable absorbent pad for one minute per square foot. Any surface less than one square foot shall also be washed for one minute. Wipe, mop, and/or sorb the solvent onto absorbent material until no visible traces of the solvent remain.

<u>RINSE 2.</u>

Wipe the surface with an absorbent pad soaked with the same organic solvent as in RINSE 1 (above) and immediately wipe up the solvent on the surface with a dry absorbent.

Appendix F. Verification Sampling Grid Calculations and Determination

Verification Sampling Grid Calculations and Determination

The verification sampling grid spacing was calculated with Visual Sample Plan (VSP) (VSP Development Team, 2016). Using VSP's function to compare a mean or median to a fixed threshold, a minimum number of samples required to meet the assigned decision parameters of the PCB cleanup (see Section 6.1) was calculated. VSP was then used to calculate grid spacing that would produce this number of samples.

The parameters necessary for calculating the number of samples by VSP are:

1. Frequency distribution (to determine statistical calculation method)
2. Estimation of the standard deviation
3. Alpha level (Type I error rate)
4. Beta level (Type II error rate)
5. Width of gray region
6. Threshold level

The first two parameters (frequency distribution and estimate of the standard deviation) were determined by statistically analyzing the total PCB concentrations in previous samples. The complete data set of samples that had been collected in the vicinity of the planned excavations (Figure A-4) is provided in Table B-1 and shown in Figure A-1 in Appendix A.

A subset was selected from this data set to conservatively represent the relevant statistical qualities (*e.g.*, standard deviation) of the PCB concentrations that would remain in soil after cleanup. This subset is comprised of results from samples collected deeper than one foot below the ground surface. Because the planned excavations will be at least one-foot deep, sample results collected at one foot and shallower are not representative of soil that will remain after cleanup. The subset also excludes results from soil samples collected in areas contaminated by discharges that could have migrated via vertical conduits, such as sumps. These data are excluded to better represent contamination resulting from downward vertical migration of PCBs from the ground surface. Specifically, the excluded results are from soil contaminated by releases at the sump on the west side of Building 52 (boring locations SB52-14-20 and SB52-14-29) and soil with PCBs detected beneath clean soil (samples SB52-14-22-8'-12' and SB52-14-28-9', with total PCB concentrations of 0.032 and 0.45 mg/kg, respectively). The subset used for the development of the grid comprises 120 samples. PCBs were detected in 22 of these 120 samples (Table F-1).

The sum of the detected Aroclors and the maximum single-Aroclor laboratory reporting limit (for Aroclors reported as not detected) were used to derive statistical parameters used in the VSP and ProUCL (see discussion below) calculations. These values are identified in Table F-1 as "Total PCB Concentration."

Table F-1. Data set of 120 samples used to calculate statistical parameters for ProUCL and VSP calculations

Sample ID	Depth (ft bgs)	Sample Date	Total PCB Concentration (mg/kg)	Detection Flag
B16-SD-057-2.0	2	1/8/16	0.09	ND
B16-SD-057-3.0	3	1/8/16	0.09	ND
B16-SD-057-4.0	4	1/8/16	0.088	ND
B52-SD-003-2.0'	2	12/8/15	0.088	ND

Table F-1. Data set of 120 samples used to calculate statistical parameters for ProUCL and VSP calculations

Sample ID	Depth (ft bgs)	Sample Date	Total PCB Concentration (mg/kg)	Detection Flag
B52-SD-003-3.0'	3	12/8/15	0.013	ND
B52-SD-003-4.0'	4	12/8/15	0.09	ND
B52-SD-008-2.0	2	12/9/15	3.3	detect
B52-SD-020-2.0	2	12/16/15	0.091	ND
B52-SD-020-3.0	3	12/16/15	0.087	ND
B52-SD-020-4.0	4	12/16/15	0.088	ND
BS-SB52A-00-16-2	2	3/17/00	0.01	ND
BS-SB-95-1-3	3	6/27/95	0.01	ND
BS-SB-95-1-6	6	6/27/95	0.01	ND
BS-SB-95-2-3	3	6/27/95	0.16	detect
BS-SB-95-2-6	6	6/27/95	0.01	ND
BS-SB-96-10-5	5	8/26/96	0.01	ND
BS-SB-96-1-5	5	7/22/96	0.01	ND
BS-SB-96-2-5	5	7/22/96	0.01	ND
BS-SB-96-3-5	5	7/22/96	0.01	ND
BS-SB-96-4-5	5	7/22/96	0.14	detect
BS-SB-96-5-1.5	1.5	7/22/96	0.02	detect
BS-SB-96-6-5	5	8/26/96	0.01	ND
BS-SB-96-8-5	5	8/26/96	0.01	ND
BS-SB-96-9-5	5	8/26/96	0.01	ND
BS-SB-97-1-1.5	1.5	3/21/97	0.31	detect
BS-SB-97-1-4.8	4.8	3/21/97	0.01	ND
BS-SB-97-2-1.5	1.5	3/21/97	0.023	detect
BS-SB-97-2-5	5	3/21/97	0.22	detect
SB52-14-20-12.5'	12.5	5/20/14	0.0098	ND
SB52-14-20-15'	15	5/20/14	0.0097	ND
SB52-14-20-20'	20	5/20/14	0.0098	ND
SB52-14-20-24'	24	5/20/14	0.0095	ND
SB52-14-22-1.5'	1.5	5/21/14	0.012	ND
SB52-14-22-4'-8'	4	5/21/14	0.012	ND
SB52-14-24-10'	10	5/21/14	0.012	ND
SB52-14-24-16'	16	5/21/14	0.012	ND
SB52-14-24-2'	2	5/21/14	0.19	detect
SB52-14-24-5'	5	5/21/14	0.012	ND
SB52-14-25-10'	10	5/20/14	0.012	ND
SB52-14-25-13'	13	5/20/14	0.012	ND
SB52-14-25-15.5'	15.5	5/20/14	0.012	ND
SB52-14-25-5'	5	5/20/14	0.012	ND

Table F-1. Data set of 120 samples used to calculate statistical parameters for ProUCL and VSP calculations

Sample ID	Depth (ft bgs)	Sample Date	Total PCB Concentration (mg/kg)	Detection Flag
SB52-14-26-3'	3	5/9/14	0.012	ND
SB52-14-26-6'	6	5/9/14	0.012	ND
SB52-14-27-10'	10	5/21/14	0.012	ND
SB52-14-27-15'	15	5/21/14	0.012	ND
SB52-14-27-2'	2	5/21/14	0.037	detect
SB52-14-27-20'	20	5/21/14	0.012	ND
SB52-14-27-24'	24	5/21/14	0.012	ND
SB52-14-27-5'	5	5/21/14	0.012	ND
SB52-14-28-3'	4	5/9/14	0.012	ND
SB52-14-28-6'	6	5/9/14	0.012	ND
SB52-14-30-1.5'	1.5	5/14/14	1.1	detect
SB52-14-30-4.5'	4.5	5/14/14	0.82	detect
SB52-14-31-2'	2	5/14/14	2.2	detect
SB52-14-31-3'	3	6/13/14	0.36	detect
SB52-14-34-2'	2	7/21/14	0.24	detect
SB52-14-35-10'	10	5/21/14	0.0099	ND
SB52-14-35-15'	15	5/21/14	0.0099	ND
SB52-14-35-2'	2	5/21/14	0.0091	J
SB52-14-35-5'	5	5/21/14	0.0098	ND
SB52-14-36-2'	2	6/13/14	0.0095	ND
SB52-14-37-2'	2	6/16/14	0.0096	ND
SB52-14-38-2'	2	6/16/14	0.074	detect
SB52-14-43-3'	3	7/7/14	4.44	detect
SB52-14-43-6'	6	7/7/14	0.062	detect
SB52-14-45-2'	2	7/21/14	0.62	detect
SB52-14-46-2.5'	2.5	7/21/14	0.07	detect
SB52-14-49-1.5'	1.5	7/30/14	0.0096	ND
SB52-14-50-1.4'	1.4	7/30/14	0.0095	ND
SB52-14-53-1.5'	1.5	7/30/14	0.0095	ND
SB52-14-55-1.4'	1.4	7/30/14	0.0094	ND
SB52-14-56-1.9'	1.9	7/30/14	0.035	detect
SB52-14-56-3.9'	3.9	7/30/14	0.0099	ND
SB52-14-57-3'	3	7/21/14	0.0098	ND
SB52-14-60-3'	3	7/21/14	0.0098	ND
SB52-14-61-3'	3	7/21/14	0.0093	ND
SB52-14-62-1.4'	1.4	7/30/14	0.0095	ND
SB52-14-8-10'	10	5/21/14	0.0097	ND
SB52-14-8-15'	15	5/21/14	0.0097	ND

Table F-1. Data set of 120 samples used to calculate statistical parameters for ProUCL and VSP calculations

Sample ID	Depth (ft bgs)	Sample Date	Total PCB Concentration (mg/kg)	Detection Flag
SB52-14-8-5'	5	5/21/14	0.0093	ND
SB52-14-8-6'	6	5/21/14	0.0098	ND
SB52-14-9A-10'	10	5/7/14	0.012	ND
SB52-14-9A-8'	8	5/7/14	0.012	ND
SB52-14-9B-10'	10	5/7/14	0.012	ND
SB52-14-9B-12'	12	5/21/14	0.0098	ND
SB52-14-9B-3'	3	5/21/14	0.0095	ND
SB52-14-9B-6'	6	5/21/14	0.0098	ND
SB52-14-9B-8'	8	5/7/14	0.012	ND
SB52-14-9B-9'	9	5/21/14	0.0097	ND
SB52A-14-1C-3'	3	7/18/14	0.207	detect
SB52A-14-1H-3'	3	7/18/14	0.0094	ND
SS52-10-1-3	3	6/11/10	0.2	ND
SS52-10-1-4	4	6/11/10	0.2	ND
SS52-10-3-3	3	6/11/10	0.2	ND
SS52-10-3-5	5	6/11/10	0.2	ND
SS52-10-4-3	3	6/11/10	0.2	ND
SS52-10-4-5	5	6/11/10	0.2	ND
SS52-10-5-3	3	6/14/10	0.2	ND
SS52-10-5-5	5	6/14/10	0.2	ND
SS52-10-6-3	3	6/11/10	0.2	ND
SS52-10-6-5	5	6/11/10	0.2	ND
SS52-10-7-3	3	6/14/10	0.2	ND
SS52-10-7-5	5	6/14/10	0.2	ND
SS52-10-8-3	3	6/14/10	0.2	ND
SS52-10-8-5	5	6/14/10	0.2	ND
SS52-10-9-3	3	6/14/10	0.2	ND
SS52-10-9-5	5	6/14/10	0.2	ND
SS52-11-1-3	3	9/16/11	1	ND
SS52-11-2-3	3	9/15/11	1	ND
SS52-11-3-3	3	9/15/11	1	ND
SS52-11-4-3	3	9/16/11	1	ND
SS52-11-5-3	3	9/15/11	1	ND
SS52-11-7-3	3	9/15/11	1	ND
SS52-11-8-3	3	9/15/11	1	ND
SS52-14-11-1.5	1.5	3/3/14	0.012	ND
SS52A-14-1-1.5	1.5	7/18/14	0.0095	ND
SS52A-14-1B-3'	3	7/18/14	0.0096	ND

Table F-1. Data set of 120 samples used to calculate statistical parameters for ProUCL and VSP calculations

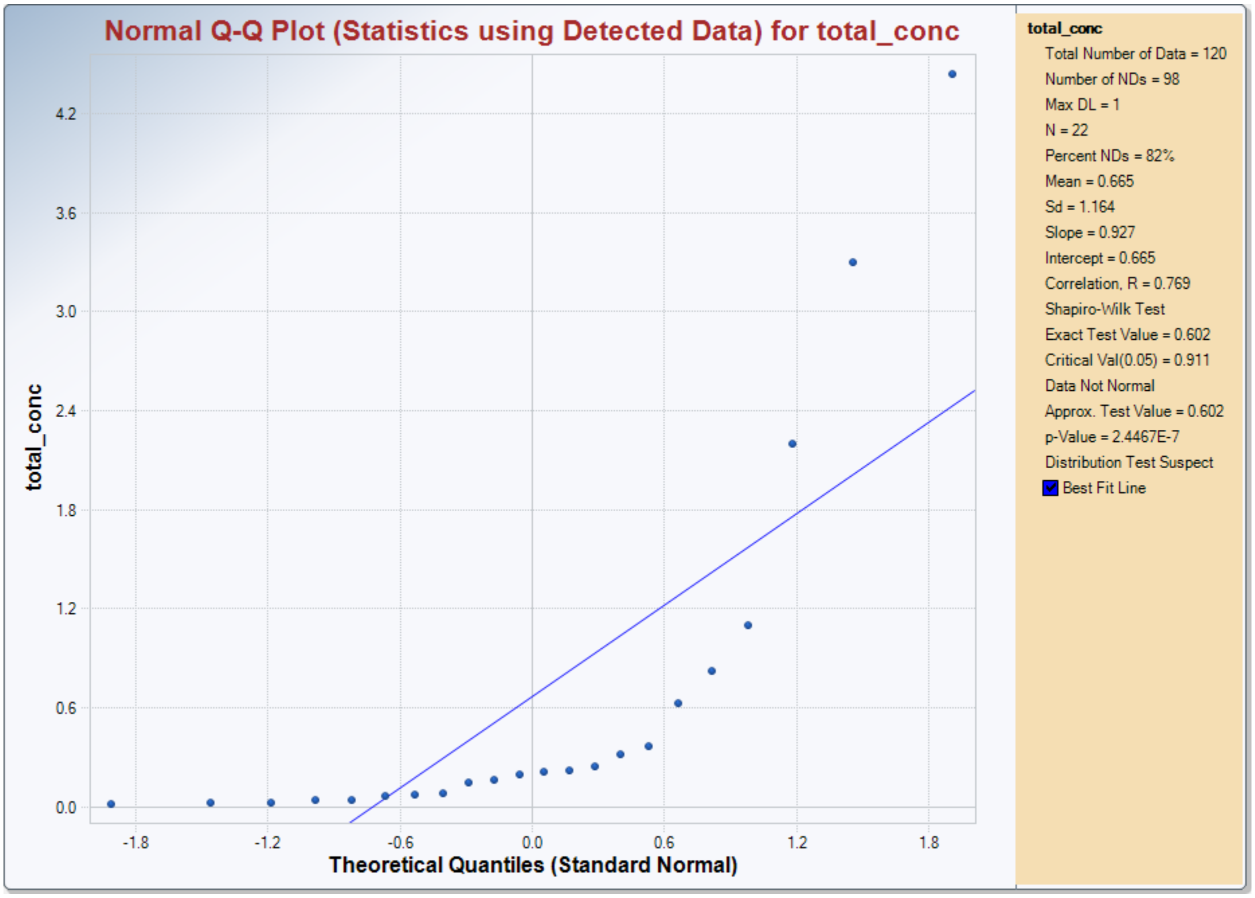
Sample ID	Depth (ft bgs)	Sample Date	Total PCB Concentration (mg/kg)	Detection Flag
SS52A-14-8-1.5	1.5	2/24/14	0.2	ND
SS52A-14-9-1.5	1.5	2/24/14	0.2	ND

Notes:
Sample IDs are the same as those in Table B-1. For those samples that did not have Sample IDs in Table B-1, the IDs given here follow the convention of appending the depth to the Location ID.

Abbreviations:
ft bgs = feet below ground surface
mg/kg = milligrams per kilogram
ND = no PCBs detected in the sample
J = PCBs were detected, but below the reporting limit

An assumed frequency distribution (input parameter 1, above) is the basis for selecting the calculation method. The data set selected (Table F-1) has a frequency distribution that is not normal or symmetrical, as illustrated by the graph and associated calculation from ProUCL in Figure F-1 (ProUCL v. 5.0.00). This graph shows a normal Q-Q plot of the 22 detected PCB concentrations that does not follow the expected straight line of a normal distribution. The conclusion of the associated Shapiro-Wilk Test is in agreement. The appropriate method in VSP to calculate the minimum number of samples from populations that are not normally distributed or symmetrical is the MARSSIM Sign Test (MARSSIM, 2000, Section 5.5.2.3). Because the data are not normally distributed, the MARSSIM Sign Test was selected because it is a non-parametric test; the other tests available in VSP for calculating the expected minimum number of samples to compare a mean to a fixed threshold are not non-parametric. The MARSSIM Sign Test is based on comparing the median value – as an estimate of the mean – to the action level.

Figure F-1. Normal Q-Q plot for checking the normality of the total PCB concentrations in the data subset.



The estimated standard deviation (input parameter 2, above) was calculated also with ProUCL, using the Kaplan-Meier method for censored data sets (US EPA, 2013, Section 4.4). The Kaplan-Meier method is a non-parametric statistical method for estimating an empirical cumulative distribution function for a censored data set. Parameters such as the standard deviation can then be derived from this function. Using the Kaplan-Meier method, the standard deviation of the data is estimated to be 0.55 mg/kg. Table F-2 shows the output from ProUCL, highlighting the estimated standard deviation using the Kaplan-Meier (KM SD) method including the non-detects.

Table F-2. Output from ProUCL showing general statistics of the PCB data set.

		General Statistics on Uncensored Data									
Date/Time of Computation				2/11/2016 8:07:58 PM							
User Selected Options											
From File		WorkSheet.xls									
Full Precision			OFF								
From File: WorkSheet.xls											
General Statistics for Censored Datasets (with NDs) using Kaplan Meier Method											
Variable	NumObs	# Missing	Num Ds	NumNDs	% NDs	Min ND	Max ND	KM Mean	KM Var	KM SD	KM CV
total_conc	120	0	22	98	81.67%	0.0093	1	0.133	0.302	0.549	4.132
General Statistics for Raw Dataset using Detected Data Only											
Variable	NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV
total_conc	22	0	0.0091	4.44	0.665	0.199	1.355	1.164	0.239	2.429	1.749
Percentiles using all Detects (Ds) and Non-Detects (NDs)											
Variable	NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
total_conc	120	0	0.00959	0.0098	0.00998	0.012	0.2	0.2	0.64	1	3.091

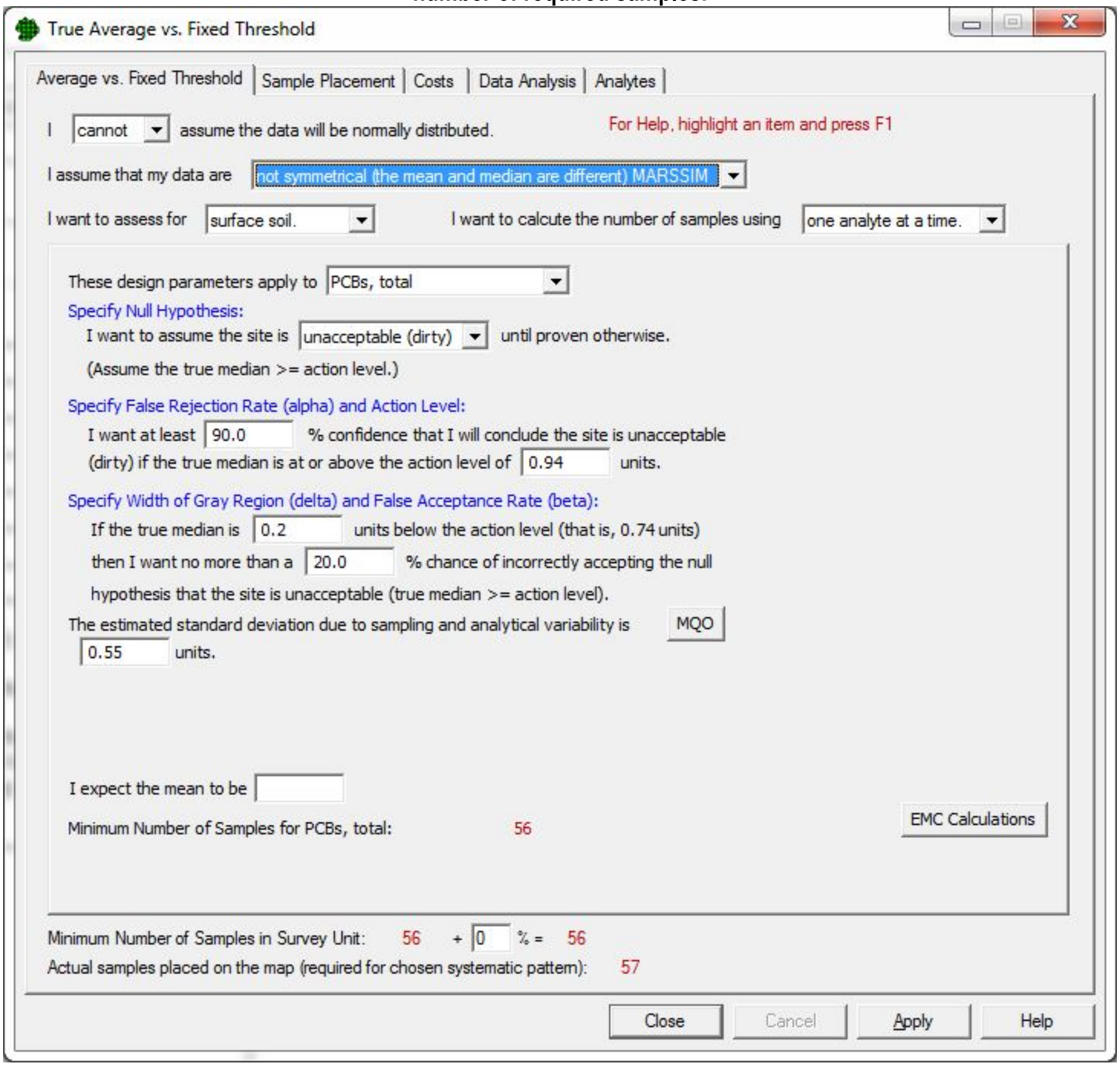
Input parameters 3 through 5 are discussed in Section 6.1 of this Work Plan. The threshold level (input parameter 6) is the 0.94 mg/kg cleanup level.

Input parameters used in VSP are summarized in Table F-3. The following screenshot (Figure F-2) illlustrates the inputs provided to VSP and the result of the calculation.

Table F-3. VSP input parameters for calculating minimum required number of samples.

Input Parameter	Value
Frequency distribution	Not normal and not symmetric
Standard-deviation estimation	0.55 mg/kg
Alpha level (Type I error rate)	10%
Beta level (Type II error rate)	20%
Width of gray region	0.2 mg/kg
Threshold level	0.94 mg/kg

Figure F-2. Screenshot from VSP showing the input parameters and resulting calculation of the minimum number of required samples.



The number of samples calculated using VSP to meet the sampling goals (i.e., Type I and II decision error probabilities, and width of the gray region per Section 6.1 of this work plan) is 56. Output from VSP is included in the Table F-4, below, and the following graphical representation (Figure F-3) shows the probability of making a correct decision as a function of the true mean.

Table F-4. Output from VSP summarizing the sampling design.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	56
Number of samples on map [a]	57
Number of selected sample areas [b]	3
Specified sampling area [c]	3521.38 ft^2
Size of grid / Area of grid cell [d]	7.9298 feet / 62.8818 ft^2
Grid pattern	Square

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.

Figure F-3. Graph showing the probability of making a correct decision given the decision parameters for the cleanup and characteristics of the assumed frequency distribution.

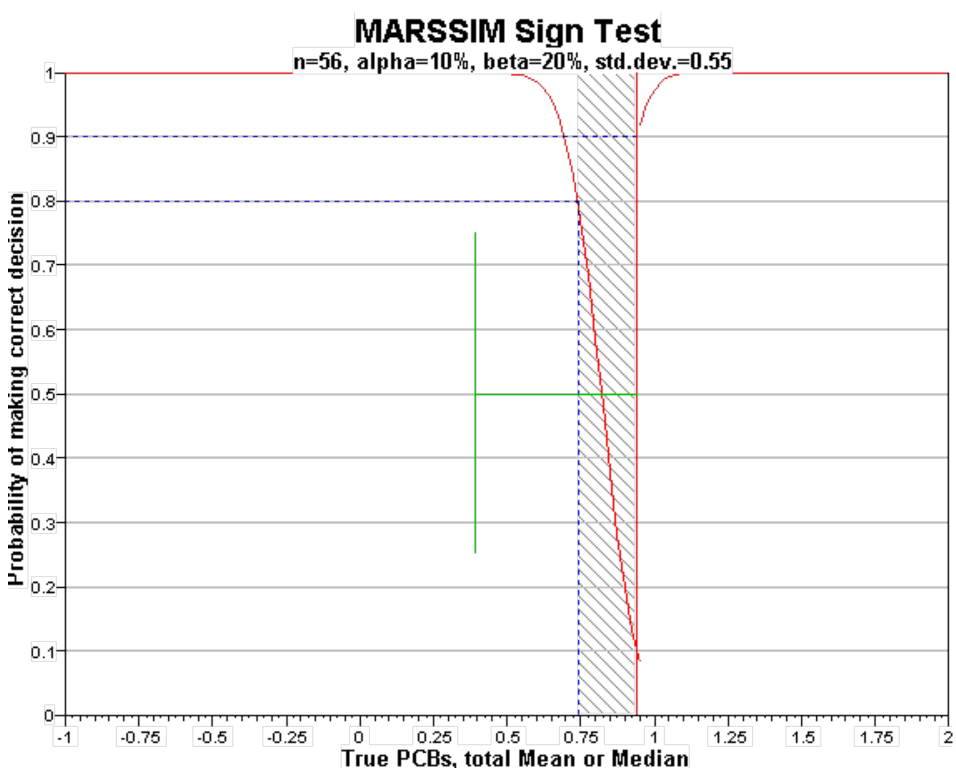
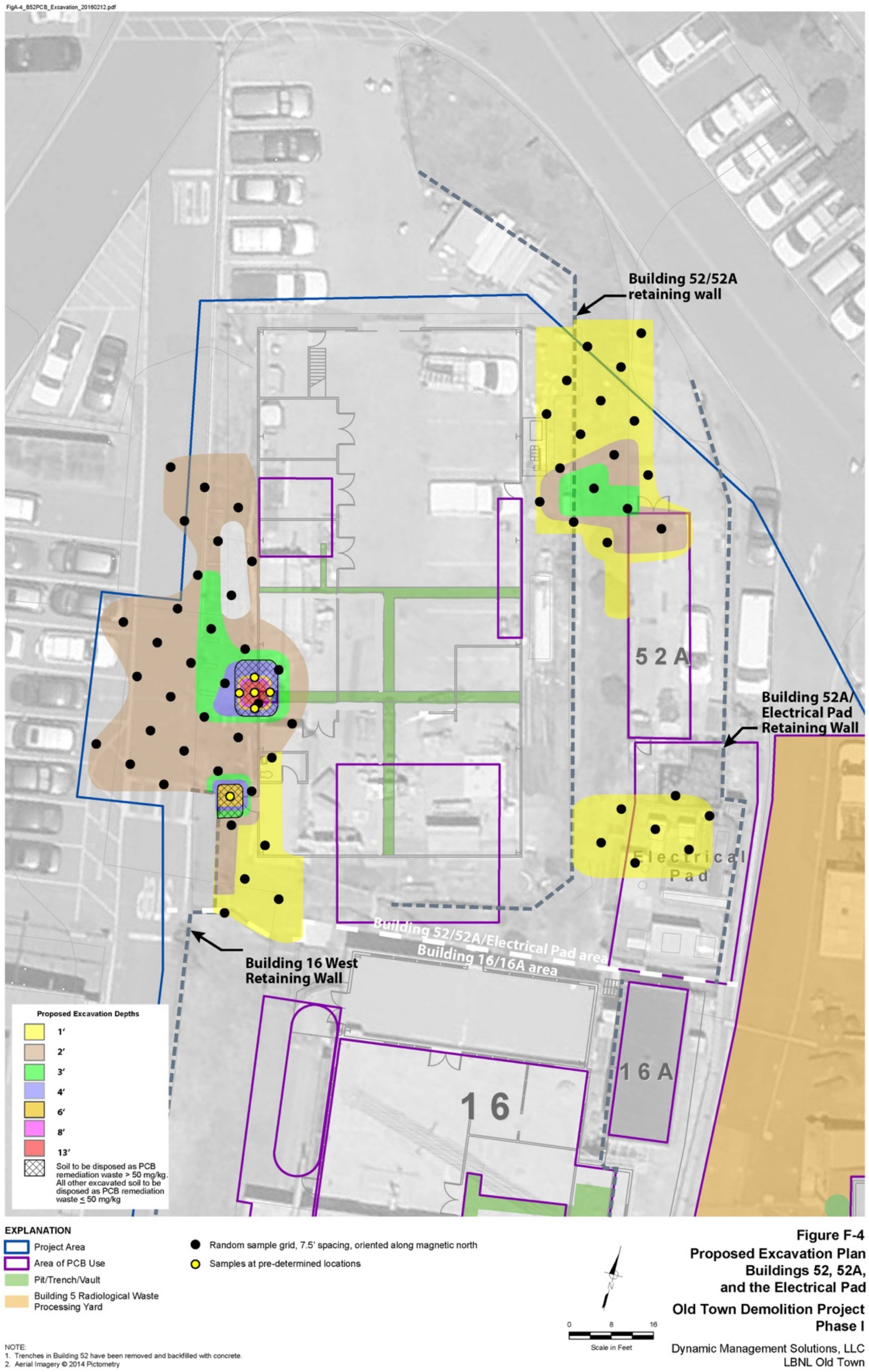


Figure F-4 is a map showing the footprints of the excavations with a probable grid layout oriented with magnetic north and at a sample spacing of 7.5 feet. In this example, this sample spacing resulted in 59 samples. This map is provided for illustrative purposes only; the actual grid layout will differ based on random starting points for the grid determined in the field. Also, because of edge effects caused by the geometries of the excavation footprints, the sample spacing might result in a different total number of samples from different starting points. A sample spacing of 7.5 feet is expected to produce at least 56 samples based on the excavation area shown in Figure A-4. If the excavation is expanded, the sample spacing will remain fixed and additional samples will be required. If the excavation area is divided into multiple decision units to allow incremental backfilling, the sample spacing will remain fixed at 7.5 feet, such that the total number of samples required for the entire excavation area (the aggregate area of decision units) will be at least 56 samples.

In addition to the randomly located samples on the regular grid, Figure F-4 shows 6 additional samples to be collected at pre-determined locations at the zones of deeper excavation where the concentrations of total PCBs exceed 50 mg/kg. These pre-determined locations are described in Section 6.2.

Figure F-4. Example sampling grid and pre-determined sample locations.



REFERENCES:

Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Revision 1, 2000.

Statistical Software ProUCL 5.0.00 for Environmental Applications for Data Sets with and without Nondetect Observations (ProUCL v.5.0.00), 2013. Updated September 19.

U.S. Environmental Protection Agency (US EPA), 2013, ProUCL Version 5.0.00 Technical Guide: Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. September.

VSP Development Team (2016). Visual Sample Plan: A Tool for Design and Analysis of Environmental Sampling. Version 7.5. Pacific Northwest National Laboratory. Richland, WA. http://vsp.pnnl.gov.

Appendix G. Special Discharge Permit issued by East Bay Municipal Utility District

EAST BAY
MUNICIPAL UTILITY DISTRICT

BENNETT K. HORENSTEIN
DIRECTOR OF WASTEWATER

January 4, 2016

CERTIFIEDMAIL
(Return Receipt Requested)
Certified Mail No. 70142870000150834743

Mr. Robert Cronin
Lawrence Berkeley National Laboratory
One Cyclotron Road, MS 75B-0101
Berkeley, CA 94720

Dear Mr. Cronin:

Re: Wastewater Discharge Permit No. 19644654

Enclosed is the Special Discharge Permit (Permit) for Lawrence Berkeley National Laboratory for the Old Town Demolition Project at One Cyclotron Road – Buildings 5, 16, 16A, 52 and 52A, Berkeley, California. Please read the Permit terms and conditions and the enclosed *Special Discharge Permit Standard Terms and Conditions,* most recent edition. As a Permit holder, you are legally responsible for complying with all Permit conditions and requirements. The permit expires on January 31, 2017.

Lawrence Berkeley National Laboratory shall report to the Environmental Services Division any changes, permanent or temporary, to the premises or operations that significantly affect the quality or volume of the permitted discharge or deviate from the terms and conditions under which the Permit was granted.

If you have any questions regarding this Permit, please contact Robert Newman of the Environmental Services Division at (510) 287-1641.

Sincerely,

JACKIE ZIPKIN
Manager of Environmental Services

Enclosures

GENERAL CONDITIONS

I. Lawrence Berkeley National Laboratory shall comply with the provisions of the following two documents:

- East Bay Municipal Utility District Wastewater Control Ordinance (Wastewater Control Ordinance)
- EBMUD Special Discharge Permit Standard Terms and Conditions, most recent edition

II. This Special Discharge Permit is a waiver of Wastewater Control Ordinance, Title I, Section 5, which prohibits the discharge of stormwater, drainage water, and groundwater to the community sewer.

III. Lawrence Berkeley National Laboratory shall discharge Special Discharge Wastewater only from the specific source described in the Special Discharge Permit Applicant Form, Lawrence Berkeley National Laboratory Old Town Demolition Project Special Discharge Permit Application for Rainwater, as depicted on the site map titled Conceptual Areas for Grading/Excavation Discharge Manhole Locations, Lawrence Berkeley National Laboratory - Figure 1.

Lawrence Berkeley National Laboratory shall request a revision of this Special Discharge Permit if additional sources of Special Discharge Wastewater are identified for discharge to the community sewer.

IV. Lawrence Berkeley National Laboratory shall immediately cease discharge of treated or managed Special Discharge Wastewater if not in compliance with any of the terms and conditions of this Special Discharge Permit.

V. Lawrence Berkeley National Laboratory shall not discharge Special Discharge Wastewater authorized by this Special Discharge Permit after the expiration date.

COMPLIANCE REQUIREMENTS

I. Lawrence Berkeley National Laboratory shall pretreat/manage, including sediment control, all Special Discharge Wastewater prior to discharge to the community sewer. Pretreatment or management shall be sufficient to achieve compliance with the benchmark values and discharge limits established in this Special Discharge Permit.

II. Lawrence Berkeley National Laboratory shall post a sign in the work area stating "All Wastewater Discharge must comply with the Special Discharge Permit."

III. Lawrence Berkeley National Laboratory shall not discharge Special Discharge Wastewater to the community sewer during a rain event or within 24 hours after a rain event, which is defined as any precipitation greater than a drizzle.

IV. Lawrence Berkeley National Laboratory shall not discharge Special Discharge Wastewater to the community sewer at a flow rate greater than 100 gallons per minute.

V. Lawrence Berkeley National Laboratory shall obtain permission from the applicable city agency to discharge Special Discharge Wastewater to the community sewer.

VI. Lawrence Berkeley National Laboratory shall discharge all Special Discharge Wastewater to the community sewer through a totalizing flow meter.

VII. Lawrence Berkeley National Laboratory shall maintain a discharge logbook for the Special Discharge Wastewater described under *General Conditions* Paragraph III. Each entry shall include the date, time, source, and total volume of all Special Discharge Wastewater discharged to the community sewer.

REPORTING REQUIREMENTS

Lawrence Berkeley National Laboratory shall submit a discharge log report, including:

- A copy of all entries recorded in the discharge logbook described under *Compliance Requirements,* Paragraph VII up to 30 days prior to the report due date.
- The authorized signature and certification statement.

The discharge log report is due quarterly with the initial report due by March 31, 2016 or within 10 days from the final discharge to the community sewer. Submit all reports, including self-monitoring, through U.S. Postal Service to East Bay Municipal Utility District, c/o Nadia Borisova, Environmental Services Division MS 702, P.O. Box 24055, Oakland, CA 94623, or electronic mail to nborisov@ebmud.com.

EBMUD

SPECIAL DISCHARGE PERMIT
Terms and Conditions

Permit Number: 19644654

WASTEWATER DISCHARGE LIMITS

Lawrence Berkeley National Laboratory shall not discharge Special Discharge Wastewater to the community sewer if the strength of the wastewater exceeds the Wastewater Control Ordinance Discharge Limits.

SELF-MONITORING REPORTING REQUIREMENTS

Lawrence Berkeley National Laboratory shall:

- Obtain one representative sample of the pretreated/managed Special Discharge Wastewater from the source described under *General Conditions* Paragraph III. Parameters to be monitored include the following: Volatile Organic Compounds by EPA 624; polychlorinated biphenyls (PCB) by EPA 1668; Total Metals by EPA 200.7; Oils and Grease Hydrocarbon by EPA 1664; and pH by 4500-H+ B. Submit analytical test results to EBMUD c/o Nadia Borisova Environmental Services Division MS 702, P.O. Box 24055, Oakland, CA 94623, or electronic mail to nborisov@ebmud.com. **EBMUD approval of analytical data is required prior to first scheduled discharge.**
- Subsequent semi-annual self-monitoring samples for PCB congeners shall be collected and analyzed approximately every six months, and not more than eight months after the previous sample, if discharge is continuing. PCB congener analyses shall be performed with the shortest feasible turn-around time. The self-monitoring reports shall be submitted via email at nborisov@ebmud.com, and shall include a signed analytical report; the chain of custody documentation, and the authorized signature and certification statement.
- The PCB data shall be obtained and reported in accordance with the requirements set forth in the San Francisco Bay Mercury and PCBs Watershed Permit, the Water Board Order R2-2012-0096, which became effective on January 1, 2013. This Order can be found at: http://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2012/R2-2012-0096.pdf
- PCB congeners limit for discharge is 0.017 microgram per liter for the sum of the PCB congeners. EBMUD may require additional treatment if discharge concentrations exceed the benchmark.

Wastewater to the community sewer is prohibited until the District reviews the self-monitoring report and approves start-up of the discharge. The District reserves the right to require additional self-monitoring if deemed necessary.

INSPECTIONS

The District may conduct random, unannounced inspections to verify compliance with the terms and conditions of this Special Discharge Permit. Lawrence Berkeley National Laboratory shall grant District personnel site access to conduct inspections and collect Special Discharge Wastewater samples.

ENFORCEMENT AND PENALTIES

Failure to comply with the terms and conditions of this Special Discharge Permit may result in enforcement actions, including violation follow-up fees, civil enforcement penalties, and administrative fines of up to $5,000 per day.

RATES AND CHARGES

This Special Discharge Permit may be amended to include changes to rates and charges that may be established by the District during the term of this Special Discharge Permit. The current treatment charge is $0.02 per gallon of Special Discharge Wastewater discharged to the community sewer. The Special Discharge Permit fee is $995 per year.

AUTHORIZATION

Lawrence Berkeley National Laboratory is hereby authorized to discharge Special Discharge Wastewater to the community sewer, subject to compliance with the *Wastewater Control Ordinance, EBMUD Special Discharge Permit Standard Terms and Conditions*, and established billing conditions.

Effective: 1/6/16

Expiration: January 31, 2017

Director, Wastewater Department

Date 1/6/16

BERKELEY LAB Lawrence Berkeley National Laboratory

Via email and certified mail
Receipt No. 7009 2820 0004 4632 9505

Reference No.: ES-16-029

November 24, 2015

Ms. Nadia Borisova
East Bay Municipal Utility District
Environmental Services Division, MS 702
P.O. Box 24055
Oakland, CA 94623-1055

Subject: Lawrence Berkeley National Laboratory Old Town Demolition Project Special Discharge Permit Application for Rainwater

Ms. Borisova,

Enclosed for your review and approval is Lawrence Berkeley Laboratory's (LBNL's) Special Discharge Permit Application for discharge of rainwater associated with LBNL's Old Town Demolition Project. Project areas that will be subject to the East Bay Municipal Utility District (EBMUD) permit include the areas associated with the demolition of Buildings 5, and 16 and 16A; the removal of the foundation slabs of these three buildings and the foundation slabs at previously demolished Buildings 52 and 52; and the removal of contaminated soil and grading of the area. Soil sampling results around these buildings have shown that the soil is contaminated with polychlorinated biphenyls, chlorinated hydrocarbons, metals (copper, zinc, lead, and mercury) and radionuclides. Once the buildings have been demolished and the slabs removed, open excavations will remain while contaminated soils are tested and removed.

A special discharge permit is requested since rainwater accumulating in these excavations during storm events has the potential of becoming contaminated and would not meet the State Water Resource Control Board's numeric action levels for stormwater discharges. The supplemental information included with the application provides an upper bound estimate of the volume of rainwater that may accumulate in open excavations. The estimated volume is based on historical data on the occurrence of rain collected at LBNL from 2002 through 2014, the assumption that the volume of rain will be equivalent to that from a 25-year 24-hour storm event on each day of rain, and a safety factor of 20 percent.

LBNL plans to treat the accumulated rainwater using the same treatment design that was successfully deployed at the Bevatron Demolition project and permitted by EBMUD under Special Discharge Permit number 50238922. Rainwater will be stored in 21,000-gallon tanks as shown in the process flow diagram included with the application, with the ability to connect additional storage tanks as needed. The treatment system will have a Zeolite media bed to reduce dissolved metals that may be present in the rainwater. Effluent quality will be monitored per EBMUD's permit conditions. To satisfy Department of Energy's requirements, radionuclides will also be monitored.

If you have any questions or require additional information, please contact Ron Pauer at ropauer@lbl.gov or 510 486 7614 or me at rdcronin@lbl.gov or 510 495 2849.

Sincerely,

R Cronin

Robert Cronin
Old Town Demolition Project Director

Enclosure:

EBMUD Special Discharge Permit Application

cc via email (w/enclosure):

Kim Abbott (kim.abbott@science.doe.gov)
Steve Armann (armann.steve@epa.gov)
David Baskin (DABaskin@lbl.gov)
Kevin Bazzell (kevin.bazzell@emcbc.doe.gov)
Bob Devany (rod@weiss.com)
James Floyd (JGFloyd@lbl.gov)
Joseph Gantos (NJGantos@lbl.gov)
Mary Gross (mary.gross@science.doe.gov)
Christina Kennedy (CKennedy@northstar.com)
David Kestell (DJKestell@lbl.gov)
Jacqueline Kepke (jkepke@ebmud.com)
Bruce Marvin (BMarvin@geosyntec.com)
Reva Nickelson (RANickelson@lbl.gov)
Dottie Norman (dnorman@northstar.com)
Jeffry Parkin (jparkin@nothstar.com)
Ron Pauer (ROPauer@lbl.gov)
Jack Salazar (JJSalazar@lbl.gov)
Carmen Santos (santos.carmen@epa.gov)
Marissa Smithwick (MLSmithwick@lbl.gov)
Jacinto Soto (jsoto@dtsc.ca.gov)
Agata Sulczynski (aas@weiss.com)
Keith Takata (keith@keithtakata.com)
Karen Toth (ktoth@dtsc.ca.gov)
Stan Tuholski (SJTuholski@lbl.gov)

SPECIAL DISCHARGE PERMIT

EBMUD

PERMIT NUMBER ____________________

APPLICANT FORM

APPLICANT BUSINESS NAME	SIC CODE
Lawrence Berkeley National Laboratory	8733

ADDRESS OF SITE DISCHARGING WASTEWATER	APPLICANT MAILING ADDRESS
1 Cyclotron Road - Buildings 5, 16, 16A, 52, and 52A STREET ADDRESS	1 Cyclotron Road, MS75B-0101 Attn.: Ron Pauer STREET ADDRESS
Berkeley (CITY) 94720 (ZIP CODE)	Berkeley (CITY) 94720 (ZIP CODE)

CONTACT PERSONS

APPLICANT

NAME	TITLE	PHONE NUMBER
Ron Pauer	Environmental Services Group Leader	510-486-7614

CONSULTANT

NAME	TITLE	PHONE NUMBER
Bruce Marvin	Principal	510-285-2753

CONTRACTOR

NAME	TITLE	PHONE NUMBER
James Patterson	Project Manager	510-495-2849

CERTIFICATION

I understand that issuance of a Special Discharge Permit does not exempt or preclude the facility from being issued a Discharge Minimization or Pollution Prevention Permit.

I understand that I am legally responsible for discharge of wastewater from the facility and for complying with the Terms and Conditions of this Special Discharge Permit.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that the qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Robert Cronin
NAME

Project Director
TITLE

R Cronin
SIGNATURE (SEE CERTIFICATION REQUIREMENTS ON INSTRUCTIONS)

11/24/15
DATE

EBMUD

SPECIAL DISCHARGE PERMIT

PERMIT NUMBER ______________________

APPLICANT FORM

Purpose: This information demonstrates the wastewater meets established criteria for a Special Discharge Permit. Check each statement that applies and supply required information.

Reasonable and cost effective means of recycling and reuse of the wastewater are unavailable. Provide information describing what means were considered, and why they were not implemented.

Off-site hauling & disposal are not feasible based on volume. Reuse is not feasible due to presence of contaminants.

The wastewater is unsuitable for discharge to the storm sewer. Provide explanation.

Not suitable due to presence of polychlorinated biphenyls, chlorinated hydrocarbons, metals (Cu, Pb, Zn, Hg) and potential for radioactive isotopes.

The wastewater is generated only within the SD-1 wastewater service area. Provide location.

LBNL, Old Town Area (Buildings 5, 16, 16A, 52, and 52A)
1 Cyclotron Road, Berkeley, California 94720

The wastewater meets source criteria. Describe the source and operations generating the wastewater. Include the Wastewater Source Category from Special Discharge Permit Standard Terms and Conditions, Section A, II.

Construction Dewatering (Category b) - Groundwater or stormwater from trenching or excavation operations.
Other Sources (Category f) - Stormwater from within containment systems during building demolition.

The wastewater is discharged during a limited period of time.

Maximum Discharge Duration: 250 days Start 01/12/16 Hours of Discharge: 0600-1700

Wastewater volume and flow will not exceed 100 gals/minute.

Total Discharge Volume: 1,893,872 gallons See Attachment 1 - Containment Calculations

Discharge to the sanitary sewer during a rain event may be prohibited. Describe containment capacity during a 10-year rain event (3.16 inches of rainfall in a 24-hour period).

Containment capacity of 21,000-GAL influent and 42,000-GAL treated minimum. Additional 21,000-GAL water storage tanks may be mobilized on an as-needed basis. See schematic of pretreatment system.

The side sewer through which the wastewater is discharged has been identified. Applicant is responsible for obtaining local permits to use manholes or cleanouts for discharge.

Attach a site diagram. Show facility location, property lines, wastewater source, drainage plumbing, the side sewer, and sampling location. See Attachment 2 - Site Diagram

Known and potential pollutants present in the wastewater are characterized.

Attach a summarized list of all pollutant concentrations present in the wastewater. Also include the complete certified laboratory analytical report. See Attachment 3 - List of Pollutant Concentrations and References

Treatment technology or best management practices have been identified that will result in the wastewater meeting discharge limits, and sediment or silt does not enter collection system.

1) Describe pretreatment or best management practices that will be used to ensure the wastewater discharge complies with EBMUD Wastewater Control Ordinance wastewater discharge limits or permit-specific limits as necessary.

Pretreatment includes: filtration (25, 5, and 1 micron) for PCB and radionuclides, four (2 parallel and 2 series) 500-pound granular activated carbon vessels for VOC and PCB, filtration (<0.5 micron) and ion exchange for metals.

2) Attach a schematic flow diagram of the pretreatment system. The diagram must accurately depict the pretreatment system as constructed. Field deviation from the diagram is not allowed, unless pretreatment system modifications are approved and the permit revised prior to the discharge. See Attachment 4 - Schematic of Pretreatment System

Supporting Materials – EBMUD Permit Application

Table of Contents

Attachment 1 Containment Capacity Calculations

Table 1: SCHEDULE OF EXCAVATION ACTIVITIES AND AREAS

Building Area	DMS SCHEDULE			SEE FIGURE 1		
	Start Date (BEGIN SLAB REMOVAL)	End Date (BACKFILLING ENDS)	Duration (DAYS)	Building/Slab (SF)	Other(s) (SF)	Area (SF)
Building 5 Demolition and Yard	12-Jan-16	1-Apr-16	79 days	10,563	4,260	14,823
Building 16, 16A, and the 16 Electrical Pad Demolition	8-Apr-16	2-Jun-16	55 days	14,987	4,728	19,715
Building Pad 52/52A Demolition	21-Mar-16	26-Apr-16	35 days	6,755	4,014	10,769

SF - square feet

Table 2: HISTORICAL RAIN DATA (2002-2014) AND EXCAVATION SCHEDULE

	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Events (EVENTS/MONTH)	1.2	2.2	1.2	1.5	1.7	1.2	0.3	0.3
Duration (DAYS/EVENT)	2.8	3.2	3	4	5.2	3.4	2.1	2.2
Rain Duration (DAYS/MONTH)	3.4	7.0	3.6	6.0	8.8	4.1	0.6	0.7
Building 5 Demolition and Yard (Days Open)			19	28	31	1		
Percentage of Month Excavation is Open			61%	100%	100%	3%		
Effective Rain Duration (DAYS/MONTH)			2.2	6.0	8.8	0.1		
Building 16, B16A, and the B16 Electrical Pad Demolition (Days Open)						22	31	2%
Percentage of Month Excavation is Open						73%	100%	7%
Effective Rain Duration (DAYS/MONTH)						3.0	0.6	0.04
Building Pad 52/52A Demolition (Days Open)					19	26		
Percentage of Month Excavation is Open					61%	87%		
Effective Rain Duration (DAYS/MONTH)					5.4	3.5		

Notes:

Rain fall frequency and durations were provided by APS Inc. (Kevin Kruizenga)

Notes:

Abbreviations:

na = not applicable

Table 3: DEWATERING VOLUME ESTIMATE

	Excavation Duration from Table 1 (DAYS)	Rain Days within Excavation Duration from Table 2 (DAYS)	Storm Event 24-HOUR 25-YEAR (IN-WATER)	Volume to Dewater Excavations (IN-WATER)	Area from Table 1 (SF)	Safety Factor for Building Demoilition BMP (PERCENT)	Volume of Water (GAL)
EXAMPLE CALCULATION #1: (RAIN DAYS) x (STORM SIZE) = INCH WATER EXAMPLE CALCULATION #2: INCH WATER x (1-FT/12-IN) x (AREA) x (7.48-GAL/CF) x Safety Factor = GALLONS							
Building 5 Demolition and Yard	79 days	17.2	5.98	102.75	14,823	1.20	1,139,263
Building 16, B16A, and the B16 Electrical Pad Demolition	55 days	3.7	5.98	21.92	19,715	1.20	323,290
Building Pad 52/52A Demolition	35 days	9.0	5.98	53.55	10,769	1.20	431,319
PROJECT TOTAL	148	25.4			45,307		1,893,872

Notes:

LBNL estimates a 5.98 inches of rainfall in a 24-hour period (25-Year with 25% terrain factor).

LBNL measured 7-inches of rainfall in a 96-hour period (February 2015) equiv. to daily average 1.75-inches per day.

EBMUD permit application containment capacity basis uses 3.16-inches of rainfall in a 24-hour period (10-Year).

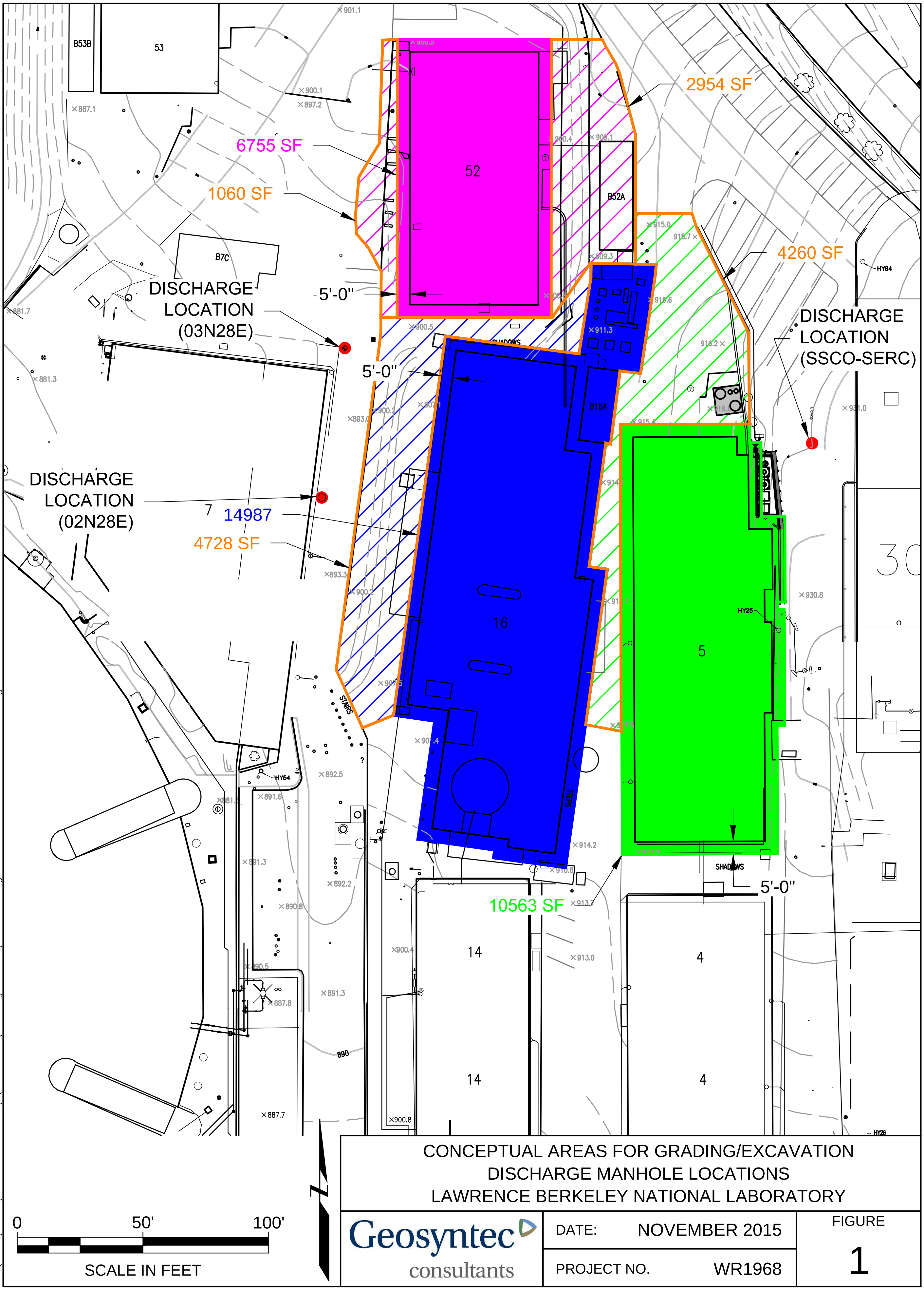
ASP Inc. Estimated Number of Rain Days based on 2002-2014 data provided in Table 2.

Safety Factor accounts for additional stormwater that may accumulate within BMP associated with building demolition.

Abbreviations:

REAP - Special Use Rain Event Action Plan by ASP Inc. (WDID Number : 2 01C373011)
IN WATER - inches of water
SF - square feet
GAL - gallon

Attachment 2 Site Diagram – Excavation Areas and Manhole Discharge Locations



CONCEPTUAL AREAS FOR GRADING/EXCAVATION
DISCHARGE MANHOLE LOCATIONS
LAWRENCE BERKELEY NATIONAL LABORATORY

Geosyntec consultants

DATE:	NOVEMBER 2015	FIGURE 1
PROJECT NO.	WR1968	

N:\Geosyntec\Lawrence Berkeley\Plan Set\Grading Areas\LB Discharge Manhole Locations exhibit.dwg

Attachment 3 List of Pollutants Concentrations Expected in Wastewater and References

Table 4: ESTIMATES OF CONTAMINANTS IN CAPTURED RAIN WATER PRIOR TO TREATMENT

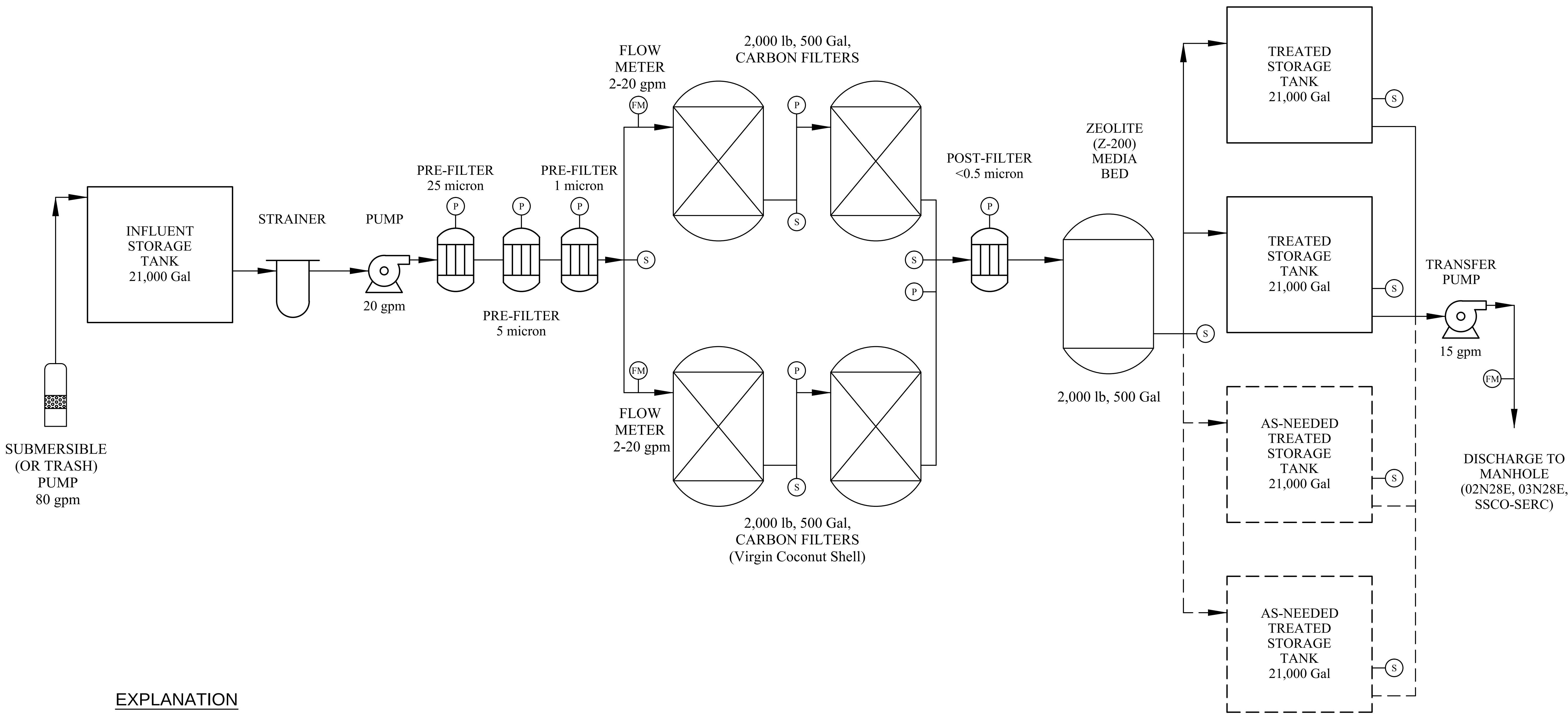
	Polychlorinated Biphenyl	Chlorinated Hydrocarbons (total identifiable)	Radioactive Materials	Total Petroleum Hydrocarbons	Metals
Analytical Method	EPA 1668 (PCB Congeners)	EPA 624 (TCE, cis-DCE, VC)	EPA 900 (Total Alpha/Beta) EPA 906 (Tritium)	EPA 8015M (Diesel/Motor Oil-Range)	EPA 200.7 (Zn, Cu, Pb) EPA 245.1 (Hg)
Building 5 Demolition and Yard	*0.36 mg/kg (Max. in Soil)*	*0.028 mg/L (Max. in Groundwater)*	*48.5/59.9 pCi/g-soil (Max. in Soil)* *0.23 pCi/g-soil (Max. in Soil)*	*376 mg/kg (Max. in Soil)*	*360,1920, 1.66 mg/kg (Max. in Soil)*
Estimated Maximum Concentration in Water	0.000072 mg/L	0.028 mg/L	10 Alpha-pCi/L 12 Beta-pCi/L 0.046 Tritium-pCi/L	0.075 mg/L	0.072 Zn-mg/L 0.38 Cu-mg/L 0.00033 Pb-mg/L
Building 16, B16A, and the B16 Electrical Pad Demolition	*52 mg/kg (Max. in Soil)*	*0.354 mg/L (Max. in Groundwater)*	*19.9/-- pCi/g-soil (Max. in Soil)* *0.6 pCi/g-soil (Max. in Soil)*	*2000 mg/kg (Max. in Soil)*	*546,240, 470, 0.58 mg/kg (Max. in Soil)*
Estimated Maximum Concentration in Water	0.010 mg/L	0.354 mg/L	4.0 Alpha-pCi/L -- Beta-pCi/L 0.12 Tritium-pCi/L	0.40 mg/L	0.11 Zn-mg/L 0.048 Cu-mg/L 0.094 Pb-mg/L 0.00012 Hg-mg/L
Building Pad 52/52A Demolition	*840 mg/kg (Max. in Soil)*	*0.354 mg/L (Max. in Groundwater)*	*--/-- pCi/g-soil (Max. in Soil)* *3.58 pCi/g-soil (Max. in Soil)*	*460 mg/kg (Max. in Soil)*	*590,190,100,0.82 mg/kg (Max. in Soil)*
Estimated Maximum Concentration in Water	0.17 mg/L		-- Alpha-pCi/L -- Beta-pCi/L 0.72 Tritium-pCi/L	0.092 mg/L	0.12 Zn-mg/L 0.038 Cu-mg/L 0.020 Pb-mg/L 0.00016 Hg-mg/L

Notes:

Assumed rainwater contains 200 mg/L of suspended solids when pollutant in soils is converted to concentration of pollutant in stormwater.

Maximum concentrations detected in each area were from Preliminary Subsurface Sample Report Old Town Demolition Project: Buildings 5, 16, 16A, 40, 41, 52 and 52A (LBNL 2014) and Estimate of Fugitive Air Emissions of Radionuclide from Diffuse Soil Sources at LBNL's Old Town Site, Buildings 5 and 16 (LBNL 2014).

Attachment 4 Schematic of Pretreatment System



EXPLANATION

S SAMPLE PORT
P PRESSURE GAUGE
FM FLOW METER

SYSTEM CONFIGURATION PROPOSED
MAXIMUM TREATMENT FLOWRATE: 20 gpm PER CARBON FILTER TRAIN
MAXIMUM DISCHARGE FLOWRATE: 15 gpm

ADDITIONAL STORAGE TANKS WILL BE PROVIDED ON AN AS-NEEDED BASIS

NOT TO SCALE

PROCESS FLOW DIAGRAM LAWRENCE BERKLEY NATIONAL LABORATORY BERKELEY, CALIFORNIA		
Geosyntec consultants	DATE: NOVEMBER 2015	FIGURE 2
	PROJECT NO. WR1968-17	

N:\Geosyntec\Lawrence Berkley\Plan Set\P&ID\LB P&ID Exhibit.dwg

Appendix H. Laboratory Certifications

Curtis & Tompkins, Ltd.

2323 Fifth Street
Berkeley, CA 94710
Phone: (510) 486-0900

Certificate No.: 2896
Renew Date: 1/31/2017

Field of Testing: 102 - Inorganic Chemistry of Drinking Water

102.022	001	Turbidity	SM2130B
102.030	001	Bromide	EPA 300.0
102.030	003	Chloride	EPA 300.0
102.030	005	Fluoride	EPA 300.0
102.030	006	Nitrate	EPA 300.0
102.030	007	Nitrite	EPA 300.0
102.030	010	Sulfate	EPA 300.0
102.045	001	Perchlorate	EPA 314.0
102.100	001	Alkalinity	SM2320B
102.120	001	Hardness	SM2340B
102.130	001	Conductivity	SM2510B
102.140	001	Total Dissolved Solids	SM2540C
102.190	001	Cyanide, Total	SM4500-CN E
102.240	001	Phosphate, Ortho	SM4500-P E
102.270	001	Surfactants	SM5540C
102.520	001	Calcium	EPA 200.7
102.520	002	Magnesium	EPA 200.7
102.520	003	Potassium	EPA 200.7
102.520	005	Sodium	EPA 200.7
102.520	006	Hardness (calculation)	EPA 200.7
102.551	002	Chlorine, Free, Combined, Total	SM4500-Cl G

Field of Testing: 103 - Toxic Chemical Elements of Drinking Water

103.130	001	Aluminum	EPA 200.7
103.130	003	Barium	EPA 200.7
103.130	004	Beryllium	EPA 200.7
103.130	005	Cadmium	EPA 200.7
103.130	007	Chromium	EPA 200.7
103.130	008	Copper	EPA 200.7
103.130	009	Iron	EPA 200.7
103.130	011	Manganese	EPA 200.7
103.130	012	Nickel	EPA 200.7
103.130	015	Silver	EPA 200.7
103.130	017	Zinc	EPA 200.7
103.140	001	Aluminum	EPA 200.8
103.140	002	Antimony	EPA 200.8
103.140	003	Arsenic	EPA 200.8
103.140	004	Barium	EPA 200.8
103.140	005	Beryllium	EPA 200.8

103.140	006	Cadmium	EPA 200.8
103.140	007	Chromium	EPA 200.8
103.140	008	Copper	EPA 200.8
103.140	009	Lead	EPA 200.8
103.140	010	Manganese	EPA 200.8
103.140	012	Nickel	EPA 200.8
103.140	013	Selenium	EPA 200.8
103.140	014	Silver	EPA 200.8
103.140	015	Thallium	EPA 200.8
103.140	016	Zinc	EPA 200.8
103.160	001	Mercury	EPA 245.1

Field of Testing: 108 - Inorganic Chemistry of Wastewater

108.112	001	Boron	EPA 200.7
108.112	002	Calcium	EPA 200.7
108.112	003	Hardness (calculation)	EPA 200.7
108.112	004	Magnesium	EPA 200.7
108.112	005	Potassium	EPA 200.7
108.112	007	Sodium	EPA 200.7
108.113	002	Calcium	EPA 200.8
108.113	003	Magnesium	EPA 200.8
108.113	004	Potassium	EPA 200.8
108.113	006	Sodium	EPA 200.8
108.120	001	Bromide	EPA 300.0
108.120	002	Chloride	EPA 300.0
108.120	003	Fluoride	EPA 300.0
108.120	004	Nitrate	EPA 300.0
108.120	005	Nitrite	EPA 300.0
108.120	008	Sulfate	EPA 300.0
108.360	001	Phenols, Total	EPA 420.1
108.381	001	Oil and Grease	EPA 1664A
108.390	001	Turbidity	SM2130B
108.410	001	Alkalinity	SM2320B
108.420	001	Hardness (calculation)	SM2340B
108.430	001	Conductivity	SM2510B
108.440	001	Residue, Total	SM2540B
108.441	001	Residue, Filterable TDS	SM2540C
108.442	001	Residue, Non-filterable TSS	SM2540D
108.443	001	Residue, Settleable	SM2540F
108.465	001	Chlorine, Total	SM4500-Cl G
108.472	001	Cyanide, Total	SM4500-CN E
108.490	001	Hydrogen Ion (pH)	SM4500-H+ B
108.491	002	Kjeldahl Nitrogen	SM4500-NH3 C (18th)
108.493	001	Ammonia	SM4500-NH3 D or E (19th/20th)
108.540	001	Phosphate, Ortho	SM4500-P E
108.541	001	Phosphorus, Total	SM4500-P E
108.551	001	Silica	SM4500-SiO2 C (20th)
108.580	001	Sulfide	SM4500-S= D

108.590	001	Biochemical Oxygen Demand	SM5210B
108.602	001	Chemical Oxygen Demand	SM5220D
108.611	001	Total Organic Carbon	SM5310C
108.640	001	Surfactants	SM5540C

Field of Testing: 109 - Toxic Chemical Elements of Wastewater

109.010	001	Aluminum	EPA 200.7
109.010	002	Antimony	EPA 200.7
109.010	003	Arsenic	EPA 200.7
109.010	004	Barium	EPA 200.7
109.010	005	Beryllium	EPA 200.7
109.010	007	Cadmium	EPA 200.7
109.010	009	Chromium	EPA 200.7
109.010	010	Cobalt	EPA 200.7
109.010	011	Copper	EPA 200.7
109.010	012	Iron	EPA 200.7
109.010	013	Lead	EPA 200.7
109.010	015	Manganese	EPA 200.7
109.010	016	Molybdenum	EPA 200.7
109.010	017	Nickel	EPA 200.7
109.010	019	Selenium	EPA 200.7
109.010	021	Silver	EPA 200.7
109.010	023	Thallium	EPA 200.7
109.010	024	Tin	EPA 200.7
109.010	026	Vanadium	EPA 200.7
109.010	027	Zinc	EPA 200.7
109.020	001	Aluminum	EPA 200.8
109.020	002	Antimony	EPA 200.8
109.020	003	Arsenic	EPA 200.8
109.020	004	Barium	EPA 200.8
109.020	005	Beryllium	EPA 200.8
109.020	006	Cadmium	EPA 200.8
109.020	007	Chromium	EPA 200.8
109.020	008	Cobalt	EPA 200.8
109.020	009	Copper	EPA 200.8
109.020	010	Lead	EPA 200.8
109.020	011	Manganese	EPA 200.8
109.020	012	Molybdenum	EPA 200.8
109.020	013	Nickel	EPA 200.8
109.020	014	Selenium	EPA 200.8
109.020	015	Silver	EPA 200.8
109.020	016	Thallium	EPA 200.8
109.020	017	Vanadium	EPA 200.8
109.020	018	Zinc	EPA 200.8
109.020	021	Iron	EPA 200.8
109.190	001	Mercury	EPA 245.1

Field of Testing: 110 - Volatile Organic Chemistry of Wastewater

110.040	040	Halogenated Hydrocarbons	EPA 624
110.040	041	Aromatic Compounds	EPA 624
110.040	042	Oxygenates	EPA 624
110.040	043	Other Volatile Organics	EPA 624

Field of Testing: 111 - Semi-volatile Organic Chemistry of Wastewater

111.100	000	Base/Neutral & Acid Organics	EPA 625
111.170	030	Pesticides & PCBs	EPA 608
111.170	031	PCBs	EPA 608

Field of Testing: 114 - Inorganic Chemistry of Hazardous Waste

114.010	001	Antimony	EPA 6010B
114.010	002	Arsenic	EPA 6010B
114.010	003	Barium	EPA 6010B
114.010	004	Beryllium	EPA 6010B
114.010	005	Cadmium	EPA 6010B
114.010	006	Chromium	EPA 6010B
114.010	007	Cobalt	EPA 6010B
114.010	008	Copper	EPA 6010B
114.010	009	Lead	EPA 6010B
114.010	010	Molybdenum	EPA 6010B
114.010	011	Nickel	EPA 6010B
114.010	012	Selenium	EPA 6010B
114.010	013	Silver	EPA 6010B
114.010	014	Thallium	EPA 6010B
114.010	015	Vanadium	EPA 6010B
114.010	016	Zinc	EPA 6010B
114.020	001	Antimony	EPA 6020
114.020	002	Arsenic	EPA 6020
114.020	003	Barium	EPA 6020
114.020	004	Beryllium	EPA 6020
114.020	005	Cadmium	EPA 6020
114.020	006	Chromium	EPA 6020
114.020	007	Cobalt	EPA 6020
114.020	008	Copper	EPA 6020
114.020	009	Lead	EPA 6020
114.020	010	Molybdenum	EPA 6020
114.020	011	Nickel	EPA 6020
114.020	012	Selenium	EPA 6020
114.020	013	Silver	EPA 6020
114.020	014	Thallium	EPA 6020
114.020	015	Vanadium	EPA 6020
114.020	016	Zinc	EPA 6020
114.103	001	Chromium (VI)	EPA 7196A
114.106	001	Chromium (VI)	EPA 7199
114.140	001	Mercury	EPA 7470A
114.141	001	Mercury	EPA 7471A
114.222	001	Cyanide	EPA 9014

114.230	001	Sulfides, Total	EPA 9034
114.240	001	Corrosivity - pH Determination	EPA 9040B
114.241	001	Corrosivity - pH Determination	EPA 9045C

Field of Testing: 115 - Extraction Test of Hazardous Waste

115.020	001	Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311
115.030	001	Waste Extraction Test (WET)	CCR Chapter11, Article 5, Appendix II
115.040	001	Synthetic Precipitation Leaching Procedure (SPLP)	EPA 1312

Field of Testing: 116 - Volatile Organic Chemistry of Hazardous Waste

116.020	031	Ethanol and Methanol	EPA 8015B
116.030	001	Gasoline-range Organics	EPA 8015B
116.040	041	Methyl tert-butyl Ether (MTBE)	EPA 8021B
116.040	062	BTEX	EPA 8021B
116.080	000	Volatile Organic Compounds	EPA 8260B
116.080	120	Oxygenates	EPA 8260B

Field of Testing: 117 - Semi-volatile Organic Chemistry of Hazardous Waste

117.010	001	Diesel-range Total Petroleum Hydrocarbons	EPA 8015B
117.110	000	Extractable Organics	EPA 8270C
117.140	000	Polynuclear Aromatic Hydrocarbons	EPA 8310
117.170	000	Nitroaromatics and Nitramines	EPA 8330
117.210	000	Pesticides & PCBs	EPA 8081A
117.220	000	PCBs	EPA 8082

Field of Testing: 118 - Radiochemistry of Hazardous Waste

118.200	001	Gamma Emitters	DOE 4.5.2.3

Field of Testing: 120 - Physical Properties of Hazardous Waste

120.010	001	Ignitability	EPA 1010
120.030	001	Corrosivity	EPA 1110
120.040	001	Reactive Cyanide	Section 7.3 SW-846
120.050	001	Reactive Sulfide	Section 7.3 SW-846
120.070	001	Corrosivity - pH Determination	EPA 9040B
120.080	001	Corrosivity - pH Determination	EPA 9045C

LABORATORY ACCREDITATION BUREAU

Certificate # L2442

Scope of Accreditation
For
Curtis & Tompkins, Ltd.

2323 Fifth St.
Berkeley, CA 94710
Teresa Morrison
(510) 486.0900

In recognition of a successful assessment to ISO/IEC 17025:2005 and the requirements of the DoD Environmental Laboratory Accreditation Program (LABPR 403 DoD ELAP) as detailed in the DoD Quality Systems Manual for Environmental Laboratories (DoD QSM V5) based on the TNI Standard - Environmental Laboratory Sector, Volume 1 – Management and Technical Requirements for Laboratories Performing Environmental Analysis, Sept 2009 (EL-V1-2009); accreditation is granted to **Curtis & Tompkins, Ltd.** to perform the following tests:

Accreditation granted through: **December 23, 2016**

Testing - Environmental

Non-Potable Water		
Technology	**Method**	**Analyte**
GC-FID	EPA 8015B/ 8015D	Gasoline Range Organics (GRO, TPH-G)
GC-FID	EPA 8015B/ 8015D	Diesel Range Organics (DRO, TPH-D)
GC-FID	RSK-175	Acetylene
GC-FID	RSK-175	Ethane
GC-FID	RSK-175	Ethene
GC-FID	RSK-175	Methane
GC-PID	EPA 8021B	MTBE
GC-PID	EPA 8021B	Benzene
GC-PID	EPA 8021B	Toluene
GC-PID	EPA 8021B	Ethylbenzene
GC-PID	EPA 8021B	m,p-Xylenes
GC-PID	EPA 8021B	o-Xylene
GC-ECD	EPA 8081A/ 8081B	Adrin
GC-ECD	EPA 8081A/ 8081B	a-BHC
GC-ECD	EPA 8081A/ 8081B	b-BHC
GC-ECD	EPA 8081A/ 8081B	d-BHC
GC-ECD	EPA 8081A/ 8081B	g-BHC
GC-ECD	EPA 8081A/ 8081B	Chlordane (Technical)
GC-ECD	EPA 8081A/ 8081B	a-Chlordane
GC-ECD	EPA 8081A/ 8081B	g-Chlordane

Non-Potable Water		
Technology	**Method**	**Analyte**
GC-ECD	EPA 8081A/ 8081B	4,4’-DDD
GC-ECD	EPA 8081A/ 8081B	4,4’-DDE
GC-ECD	EPA 8081A/ 8081B	4,4’-DDT
GC-ECD	EPA 8081A/ 8081B	Dieldrin
GC-ECD	EPA 8081A/ 8081B	Endosulfan I
GC-ECD	EPA 8081A/ 8081B	Endosulfan II
GC-ECD	EPA 8081A/ 8081B	Endosulfan Sulfate
GC-ECD	EPA 8081A/ 8081B	Endrin
GC-ECD	EPA 8081A/ 8081B	Endrin Aldehyde
GC-ECD	EPA 8081A/ 8081B	Endrin Ketone
GC-ECD	EPA 8081A/ 8081B	Heptachlor
GC-ECD	EPA 8081A/ 8081B	Heptachlor Epoxide
GC-ECD	EPA 8081A/ 8081B	Methoxychlor
GC-ECD	EPA 8081A/ 8081B	Toxaphene
GC-ECD	EPA 8082/ 8082A	Arochlor 1016
GC-ECD	EPA 8082/ 8082A	Arochlor 1221
GC-ECD	EPA 8082/ 8082A	Arochlor 1232
GC-ECD	EPA 8082/ 8082A	Arochlor 1242
GC-ECD	EPA 8082/ 8082A	Arochlor 1248
GC-ECD	EPA 8082/ 8082A	Arochlor 1254
GC-ECD	EPA 8082/ 8082A	Arochlor 1260
GC-MS	EPA 8260B/ 8260C	1,1,1,2-Tetrachloroethane
GC-MS	EPA 8260B/ 8260C	1,1,1-Trichloroethane
GC-MS	EPA 8260B/ 8260C	1,1,2,2-Tetrachloroethane
GC-MS	EPA 8260B/ 8260C	1,1,2-Trichloroethane
GC-MS	EPA 8260B/ 8260C	1,1-Dichloroethane
GC-MS	EPA 8260B/ 8260C	1,1-Dichloroethene
GC-MS	EPA 8260B/ 8260C	1,1-Dichloropropene
GC-MS	EPA 8260B/ 8260C	1,2,3-Trichlorobenzene
GC-MS	EPA 8260B/ 8260C	1,2,3-Trichloropropane
GC-MS	EPA 8260B/ 8260C	1,2,4-Trichlorobenzene
GC-MS	EPA 8260B/ 8260C	1,2,4-Trimethylbenzene
GC-MS	EPA 8260B/ 8260C	1,2-Dibromo-3-Chloropropane
GC-MS	EPA 8260B/ 8260C	1,2-Dibromoethane
GC-MS	EPA 8260B/ 8260C	1,2-Dichlorobenzene
GC-MS	EPA 8260B/ 8260C	1,2-Dichloroethane
GC-MS	EPA 8260B/ 8260C	1,2-Dichloropropane
GC-MS	EPA 8260B/ 8260C	1,3,5-Trimethylbenzene
GC-MS	EPA 8260B/ 8260C	1,3-Dichlorobenzene
GC-MS	EPA 8260B/ 8260C	1,3-Dichloropropane

Non-Potable Water

Technology	Method	Analyte
GC-MS	EPA 8260B/ 8260C	1,4-Dichlorobenzene
GC-MS	EPA 8260B/ 8260C	2,2-Dichloropropane
GC-MS	EPA 8260B/ 8260C	2-Butanone
GC-MS	EPA 8260B/ 8260C	2-Chlorotoluene
GC-MS	EPA 8260B/ 8260C	2-Hexanone
GC-MS	EPA 8260B/ 8260C	4-Chlorotoluene
GC-MS	EPA 8260B/ 8260C	4-Methyl-2-Pentanone
GC-MS	EPA 8260B/ 8260C	Acetone
GC-MS	EPA 8260B/ 8260C	Benzene
GC-MS	EPA 8260B/ 8260C	Bromobenzene
GC-MS	EPA 8260B/ 8260C	Bromochloromethane
GC-MS	EPA 8260B/ 8260C	Bromodichloromethane
GC-MS	EPA 8260B/ 8260C	Bromoform
GC-MS	EPA 8260B/ 8260C	Bromomethane
GC-MS	EPA 8260B/ 8260C	Carbon Disulfide
GC-MS	EPA 8260B/ 8260C	Carbon Tetrachloride
GC-MS	EPA 8260B/ 8260C	Chlorobenzene
GC-MS	EPA 8260B/ 8260C	Chloroethane
GC-MS	EPA 8260B/ 8260C	Chloroform
GC-MS	EPA 8260B/ 8260C	Chloromethane
GC-MS	EPA 8260B/ 8260C	cis-1,2-Dichloroethene
GC-MS	EPA 8260B/ 8260C	cis-1,3-Dichloropropene
GC-MS	EPA 8260B/ 8260C	Dibromochloromethane
GC-MS	EPA 8260B/ 8260C	Dibromomethane
GC-MS	EPA 8260B/ 8260C	Ethylbenzene
GC-MS	EPA 8260B/ 8260C	Ethyl tert-Butyl Ether (ETBE)
GC-MS	EPA 8260B/ 8260C	Freon 113
GC-MS	EPA 8260B/ 8260C	Freon 12
GC-MS	EPA 8260B/ 8260C	Hexachlorobutadiene
GC-MS	EPA 8260B/ 8260C	Isopropylbenzene
GC-MS	EPA 8260B/ 8260C	Isopropyl Ether (DIPE)
GC-MS	EPA 8260B/ 8260C	m,p-Xylenes
GC-MS	EPA 8260B/ 8260C	Methylene Chloride
GC-MS	EPA 8260B/ 8260C	Methyl tert-Amyl Ether (TAME)
GC-MS	EPA 8260B/ 8260C	Methyl tert-Butyl Ether (MTBE)
GC-MS	EPA 8260B/ 8260C	Naphthalene
GC-MS	EPA 8260B/ 8260C	n-Butylbenzene
GC-MS	EPA 8260B/ 8260C	o-Xylene
GC-MS	EPA 8260B/ 8260C	para-Isopropyl Toluene
GC-MS	EPA 8260B/ 8260C	Propylbenzene

Non-Potable Water		
Technology	**Method**	**Analyte**
GC-MS	EPA 8260B/ 8260C	sec-Butylbenzene
GC-MS	EPA 8260B/ 8260C	Styrene
GC-MS	EPA 8260B/ 8260C	tert-Butyl Alcohol (TBA)
GC-MS	EPA 8260B/ 8260C	tert-Butylbenzene
GC-MS	EPA 8260B/ 8260C	Tetrachloroethene
GC-MS	EPA 8260B/ 8260C	Toluene
GC-MS	EPA 8260B/ 8260C	trans-1,2-Dichloroethene
GC-MS	EPA 8260B/ 8260C	trans-1,3-Dichloropropene
GC-MS	EPA 8260B/ 8260C	Trichloroethene
GC-MS	EPA 8260B/ 8260C	Trichlorofluoromethane
GC-MS	EPA 8260B/ 8260C	Vinyl Acetate
GC-MS	EPA 8260B/ 8260C	Vinyl Chloride
GC-MS	EPA 8270C/ 8270D	1,2,4-Trichlorobenzene
GC-MS	EPA 8270C/ 8270D	1,2-Dichlorobenzene
GC-MS	EPA 8270C/ 8270D	1,3-Dichlorobenzene
GC-MS	EPA 8270C/ 8270D	1,4-Dichlorobenzene
GC-MS	EPA 8270C/ 8270D	2,4,5-Trichlorophenol
GC-MS	EPA 8270C/ 8270D	2,4,6-Trichlorophenol
GC-MS	EPA 8270C/ 8270D	2,4-Dichlorophenol
GC-MS	EPA 8270C/ 8270D	2,4-Dimethylphenol
GC-MS	EPA 8270C/ 8270D	2,4-Dinitrophenol
GC-MS	EPA 8270C/ 8270D	2,4-Dinitrotoluene
GC-MS	EPA 8270C/ 8270D	2,6-Dinitrotoluene
GC-MS	EPA 8270C/ 8270D	2-Chloronaphthalene
GC-MS	EPA 8270C/ 8270D	2-Chlorophenol
GC-MS	EPA 8270C/ 8270D	2-Methylnaphthalene
GC-MS	EPA 8270C/ 8270D	2-Methylphenol
GC-MS	EPA 8270C/ 8270D	2-Nitroaniline
GC-MS	EPA 8270C/ 8270D	2-Nitrophenol
GC-MS	EPA 8270C/ 8270D	3,3'-Dichlorobenzidine
GC-MS	EPA 8270C/ 8270D	3-Nitroaniline
GC-MS	EPA 8270C/ 8270D	4,6-Dinitro-2-methylphenol
GC-MS	EPA 8270C/ 8270D	4-Bromophenyl-phenylether
GC-MS	EPA 8270C/ 8270D	4-Chloro-3-methylphenol
GC-MS	EPA 8270C/ 8270D	4-Chloroaniline
GC-MS	EPA 8270C/ 8270D	4-Chlorophenyl-phenylether
GC-MS	EPA 8270C/ 8270D	4-Methylphenol
GC-MS	EPA 8270C/ 8270D	4-Nitroaniline
GC-MS	EPA 8270C/ 8270D	4-Nitrophenol
GC-MS	EPA 8270C/ 8270D	Acenaphthene

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Non-Potable Water		
Technology	**Method**	**Analyte**
GC-MS	EPA 8270C/ 8270D	Acenaphthylene
GC-MS	EPA 8270C/ 8270D	Anthracene
GC-MS	EPA 8270C/ 8270D	Azobenzene
GC-MS	EPA 8270C/ 8270D	Benzo(a)anthracene
GC-MS	EPA 8270C/ 8270D	Benzo(a)pyrene
GC-MS	EPA 8270C/ 8270D	Benzo(b)fluoranthene
GC-MS	EPA 8270C/ 8270D	Benzo(g,h,i)perylene
GC-MS	EPA 8270C/ 8270D	Benzo(k)fluoranthene
GC-MS	EPA 8270C/ 8270D	Benzoic acid
GC-MS	EPA 8270C/ 8270D	Benzyl alcohol
GC-MS	EPA 8270C/ 8270D	bis(2-Chloroethoxy)methane
GC-MS	EPA 8270C/ 8270D	bis(2-Chloroethyl)ether
GC-MS	EPA 8270C/ 8270D	bis(2-Chloroisopropyl) ether
GC-MS	EPA 8270C/ 8270D	bis(2-Ethylhexyl)phthalate
GC-MS	EPA 8270C/ 8270D	Butylbenzylphthalate
GC-MS	EPA 8270C/ 8270D	Chrysene
GC-MS	EPA 8270C/ 8270D	Dibenz(a,h)anthracene
GC-MS	EPA 8270C/ 8270D	Dibenzofuran
GC-MS	EPA 8270C/ 8270D	Diethylphthalate
GC-MS	EPA 8270C/ 8270D	Dimethylphthalate
GC-MS	EPA 8270C/ 8270D	Di-n-butylphthalate
GC-MS	EPA 8270C/ 8270D	Di-n-octylphthalate
GC-MS	EPA 8270C/ 8270D	Fluoranthene
GC-MS	EPA 8270C/ 8270D	Fluorene
GC-MS	EPA 8270C/ 8270D	Hexachlorobenzene
GC-MS	EPA 8270C/ 8270D	Hexachlorobutadiene
GC-MS	EPA 8270C/ 8270D	Hexachlorocyclopentadiene
GC-MS	EPA 8270C/ 8270D	Hexachloroethane
GC-MS	EPA 8270C/ 8270D	Indeno(1,2,3-cd)pyrene
GC-MS	EPA 8270C/ 8270D	Isophorone
GC-MS	EPA 8270C/ 8270D	Naphthalene
GC-MS	EPA 8270C/ 8270D	Nitrobenzene
GC-MS	EPA 8270C/ 8270D	N-Nitrosodimethylamine
GC-MS	EPA 8270C/ 8270D	N-Nitroso-di-n-propylamine
GC-MS	EPA 8270C/ 8270D	N-Nitrosodiphenylamine
GC-MS	EPA 8270C/ 8270D	Pentachlorophenol
GC-MS	EPA 8270C/ 8270D	Phenanthrene
GC-MS	EPA 8270C/ 8270D	Phenol
GC-MS	EPA 8270C/ 8270D	Pyrene

Non-Potable Water

Technology	Method	Analyte
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	1,4-Dioxane
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Acenaphthylene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Acenaphthene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Anthracene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Benzo(a)anthracene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Benzo(a)pyrene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Benzo(b)fluoranthene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Benzo(g,h,i)perylene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Benzo(k)fluoranthene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Chrysene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Dibenz(a,h)anthracene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Fluoranthene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Fluorene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Indeno(1,2,3-cd)pyrene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	1-Methylnaphthalene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	2-Methylnaphthalene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Naphthalene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Phenanthrene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Pyrene
HPLC-UV	EPA 8330/ 8330A	2-Amino-4,6-dinitrotoluene
HPLC-UV	EPA 8330/ 8330A	4-Amino-2,6-dinitrotoluene
HPLC-UV	EPA 8330/ 8330A	3,5-Dinitroaniline
HPLC-UV	EPA 8330/ 8330A	1,3-Dinitrotoluene
HPLC-UV	EPA 8330/ 8330A	2,4-Dinitrotoluene
HPLC-UV	EPA 8330/ 8330A	2,6-Dinitrotoluene
HPLC-UV	EPA 8330/ 8330A	HMX

Non-Potable Water

Technology	Method	Analyte
HPLC-UV	EPA 8330/ 8330A	RDX
HPLC-UV	EPA 8330/ 8330A	Nitroglycerine
HPLC-UV	EPA 8330/ 8330A	Nitrobenzene
HPLC-UV	EPA 8330/ 8330A	2-Nitrotoluene
HPLC-UV	EPA 8330/ 8330A	3-Nitrotoluene
HPLC-UV	EPA 8330/ 8330A	4-Nitrotoluene
HPLC-UV	EPA 8330/ 8330A	Pentaerythritol (PETN)
HPLC-UV	EPA 8330/ 8330A	RDX
HPLC-UV	EPA 8330/ 8330A	Tetryl
HPLC-UV	EPA 8330/ 8330A	1,3,5-Trinitrobenzene
HPLC-UV	EPA 8330/ 8330A	2,4,6-Trinitrotoluene
ICP-AES	EPA 6010B/ 6010C	Aluminum
ICP-AES	EPA 6010B/ 6010C	Antimony
ICP-AES	EPA 6010B/ 6010C	Arsenic
ICP-AES	EPA 6010B/ 6010C	Barium
ICP-AES	EPA 6010B/ 6010C	Beryllium
ICP-AES	EPA 6010B/ 6010C	Cadmium
ICP-AES	EPA 6010B/ 6010C	Calcium
ICP-AES	EPA 6010B/ 6010C	Chromium
ICP-AES	EPA 6010B/ 6010C	Cobalt
ICP-AES	EPA 6010B/ 6010C	Copper
ICP-AES	EPA 6010B/ 6010C	Iron
ICP-AES	EPA 6010B/ 6010C	Lead
ICP-AES	EPA 6010B/ 6010C	Magnesium
ICP-AES	EPA 6010B/ 6010C	Manganese
ICP-AES	EPA 6010B/ 6010C	Molybdenum
ICP-AES	EPA 6010B/ 6010C	Nickel
ICP-AES	EPA 6010B/ 6010C	Potassium
ICP-AES	EPA 6010B/ 6010C	Selenium
ICP-AES	EPA 6010B/ 6010C	Silver
ICP-AES	EPA 6010B/ 6010C	Sodium
ICP-AES	EPA 6010B/ 6010C	Thallium
ICP-AES	EPA 6010B/ 6010C	Vanadium
ICP-AES	EPA 6010B/ 6010C	Zinc
ICP-MS	EPA 6020/ 6020A	Aluminum
ICP-MS	EPA 6020/ 6020A	Antimony
ICP-MS	EPA 6020/ 6020A	Arsenic
ICP-MS	EPA 6020/ 6020A	Barium
ICP-MS	EPA 6020/ 6020A	Beryllium
ICP-MS	EPA 6020/ 6020A	Cadmium

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Non-Potable Water		
Technology	**Method**	**Analyte**
ICP-MS	EPA 6020/ 6020A	Calcium
ICP-MS	EPA 6020/ 6020A	Chromium
ICP-MS	EPA 6020/ 6020A	Cobalt
ICP-MS	EPA 6020/ 6020A	Copper
ICP-MS	EPA 6020/ 6020A	Iron
ICP-MS	EPA 6020/ 6020A	Lead
ICP-MS	EPA 6020/ 6020A	Magnesium
ICP-MS	EPA 6020/ 6020A	Manganese
ICP-MS	EPA 6020/ 6020A	Molybdenum
ICP-MS	EPA 6020/ 6020A	Nickel
ICP-MS	EPA 6020/ 6020A	Potassium
ICP-MS	EPA 6020/ 6020A	Selenium
ICP-MS	EPA 6020/ 6020A	Silver
ICP-MS	EPA 6020/ 6020A	Sodium
ICP-MS	EPA 6020/ 6020A	Thallium
ICP-MS	EPA 6020/ 6020A	Vanadium
ICP-MS	EPA 6020/ 6020A	Zinc
CVAA	EPA 7470A	Mercury
Ion Chromatography	EPA 300.0 / 9056	Bromide
Ion Chromatography	EPA 300.0 / 9056	Chloride
Ion Chromatography	EPA 300.0 / 9056	Fluoride
Ion Chromatography	EPA 300.0 / 9056	Nitrate-N
Ion Chromatography	EPA 300.0 / 9056	Nitrite-N
Ion Chromatography	EPA 300.0 / 9056	Sulfate
Ion Chromatography	EPA 314	Perchlorate
Ion Chromatography	EPA 7199	Hexavalent Chromium
Ion Selective Electrode	SM 4500-NH3 D	Ammonia
Ion Selective Electrode	SM 5210B	Biochemical Oxygen Demand (BOD)
Ion Selective Electrode	EPA 9040B SM 4500-H +B	pH
Ion Selective Electrode	SM 2510B	Specific Conductance
UV-VIS Spectrometer	SM 5220D	Chemical Oxygen Demand (COD)
UV-VIS Spectrometer	SM 4500-CN E EPA 9010B/ 9014	Cyanide
UV-VIS Spectrometer	SM 4500-CN E EPA 9010B/ 9014	Cyanide, Amenable
UV-VIS Spectrometer	SM 3500-Fe B	Ferrous Iron
UV-VIS Spectrometer	EPA 7196A	Hexavalent Chromium
UV-VIS Spectrometer	SM 4500-P E	Total Phosphate-P
UV-VIS Spectrometer	SM 4500-S2 D	Sulfide
UV-VIS Spectrometer	SM 5310C	Total Organic Carbon (TOC)

Non-Potable Water		
Technology	**Method**	**Analyte**
Titration	SM 2320B	Alkalinity
Titration	SM 4500-NH3 C	Total Kjeldahl Nitrogen (TKN)
Gravimetric	SM 2540C	Total Dissolved Solids (TDS)
Gravimetric	SM 2540D	Total Suspended Solids (TSS)
Other	EPA 1010 ASTM D93	Flash Point
Preparation	**Method**	**Analyte**
Purge & Trap	EPA 5030B/ 5030C	Preparation for Volatiles
Extraction	EPA 3520C	Continuous Liquid-Liquid Extraction for Semivolatile Organics (DRO, BNA, PCB, Pesticides, SIM)
Extraction	EPA 3535	Solid Phase Extraction (for Nitroaromatics & Nitramines)
Digestion	EPA 200.8	Water Digestion for ICP-MS Metals
Digestion	EPA 3010A	Water Digestion for ICP Metals

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC-FID	EPA 8015B/ 8015D	Gasoline Range Organics (GRO, TPH-G)
GC-FID	EPA 8015B/ 8015D	Diesel Range Organics (DRO, TPH-D)
GC-PID	EPA 8021B	MTBE
GC-PID	EPA 8021B	Benzene
GC-PID	EPA 8021B	Toluene
GC-PID	EPA 8021B	Ethylbenzene
GC-PID	EPA 8021B	m,p-Xylenes
GC-PID	EPA 8021B	o-Xylene
GC-ECD	EPA 8081A/ 8081B	Adrin
GC-ECD	EPA 8081A/ 8081B	a-BHC
GC-ECD	EPA 8081A/ 8081B	b-BHC
GC-ECD	EPA 8081A/ 8081B	d-BHC
GC-ECD	EPA 8081A/ 8081B	g-BHC
GC-ECD	EPA 8081A/ 8081B	Chlordane (Technical)
GC-ECD	EPA 8081A/ 8081B	a-Chlordane
GC-ECD	EPA 8081A/ 8081B	g-Chlordane
GC-ECD	EPA 8081A/ 8081B	4,4'-DDD
GC-ECD	EPA 8081A/ 8081B	4,4'-DDE
GC-ECD	EPA 8081A/ 8081B	4,4'-DDT
GC-ECD	EPA 8081A/ 8081B	Dieldrin
GC-ECD	EPA 8081A/ 8081B	Endosulfan I
GC-ECD	EPA 8081A/ 8081B	Endosulfan II
GC-ECD	EPA 8081A/ 8081B	Endosulfan Sulfate

Solid and Chemical Materials

Technology	Method	Analyte
GC-ECD	EPA 8081A/ 8081B	Endrin
GC-ECD	EPA 8081A/ 8081B	Endrin Aldehyde
GC-ECD	EPA 8081A/ 8081B	Endrin Ketone
GC-ECD	EPA 8081A/ 8081B	Heptachlor
GC-ECD	EPA 8081A/ 8081B	Heptachlor Epoxide
GC-ECD	EPA 8081A/ 8081B	Methoxychlor
GC-ECD	EPA 8081A/ 8081B	Toxaphene
GC-ECD	EPA 8082/ 8082A	Arochlor 1016
GC-ECD	EPA 8082/ 8082A	Arochlor 1221
GC-ECD	EPA 8082/ 8082A	Arochlor 1232
GC-ECD	EPA 8082/ 8082A	Arochlor 1242
GC-ECD	EPA 8082/ 8082A	Arochlor 1248
GC-ECD	EPA 8082/ 8082A	Arochlor 1254
GC-ECD	EPA 8082/ 8082A	Arochlor 1260
GC-MS	EPA 8260B/ 8260C	1,1,1,2-Tetrachloroethane
GC-MS	EPA 8260B/ 8260C	1,1,1-Trichloroethane
GC-MS	EPA 8260B/ 8260C	1,1,2,2-Tetrachloroethane
GC-MS	EPA 8260B/ 8260C	1,1,2-Trichloroethane
GC-MS	EPA 8260B/ 8260C	1,1-Dichloroethane
GC-MS	EPA 8260B/ 8260C	1,1-Dichloroethene
GC-MS	EPA 8260B/ 8260C	1,1-Dichloropropene
GC-MS	EPA 8260B/ 8260C	1,2,3-Trichlorobenzene
GC-MS	EPA 8260B/ 8260C	1,2,3-Trichloropropane
GC-MS	EPA 8260B/ 8260C	1,2,4-Trichlorobenzene
GC-MS	EPA 8260B/ 8260C	1,2,4-Trimethylbenzene
GC-MS	EPA 8260B/ 8260C	1,2-Dibromo-3-Chloropropane
GC-MS	EPA 8260B/ 8260C	1,2-Dibromoethane
GC-MS	EPA 8260B/ 8260C	1,2-Dichlorobenzene
GC-MS	EPA 8260B/ 8260C	1,2-Dichloroethane
GC-MS	EPA 8260B/ 8260C	1,2-Dichloropropane
GC-MS	EPA 8260B/ 8260C	1,3,5-Trimethylbenzene
GC-MS	EPA 8260B/ 8260C	1,3-Dichlorobenzene
GC-MS	EPA 8260B/ 8260C	1,3-Dichloropropane
GC-MS	EPA 8260B/ 8260C	1,4-Dichlorobenzene
GC-MS	EPA 8260B/ 8260C	2,2-Dichloropropane
GC-MS	EPA 8260B/ 8260C	2-Butanone
GC-MS	EPA 8260B/ 8260C	2-Chlorotoluene
GC-MS	EPA 8260B/ 8260C	2-Hexanone
GC-MS	EPA 8260B/ 8260C	4-Chlorotoluene
GC-MS	EPA 8260B/ 8260C	4-Methyl-2-Pentanone

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Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC-MS	EPA 8260B/ 8260C	Acetone
GC-MS	EPA 8260B/ 8260C	Benzene
GC-MS	EPA 8260B/ 8260C	Bromobenzene
GC-MS	EPA 8260B/ 8260C	Bromochloromethane
GC-MS	EPA 8260B/ 8260C	Bromodichloromethane
GC-MS	EPA 8260B/ 8260C	Bromoform
GC-MS	EPA 8260B/ 8260C	Bromomethane
GC-MS	EPA 8260B/ 8260C	Carbon Disulfide
GC-MS	EPA 8260B/ 8260C	Carbon Tetrachloride
GC-MS	EPA 8260B/ 8260C	Chlorobenzene
GC-MS	EPA 8260B/ 8260C	Chloroethane
GC-MS	EPA 8260B/ 8260C	Chloroform
GC-MS	EPA 8260B/ 8260C	Chloromethane
GC-MS	EPA 8260B/ 8260C	cis-1,2-Dichloroethene
GC-MS	EPA 8260B/ 8260C	cis-1,3-Dichloropropene
GC-MS	EPA 8260B/ 8260C	Dibromochloromethane
GC-MS	EPA 8260B/ 8260C	Dibromomethane
GC-MS	EPA 8260B/ 8260C	Ethylbenzene
GC-MS	EPA 8260B/ 8260C	Ethyl tert-Butyl Ether (ETBE)
GC-MS	EPA 8260B/ 8260C	Freon 113
GC-MS	EPA 8260B/ 8260C	Freon 12
GC-MS	EPA 8260B/ 8260C	Hexachlorobutadiene
GC-MS	EPA 8260B/ 8260C	Isopropylbenzene
GC-MS	EPA 8260B/ 8260C	Isopropyl Ether (DIPE)
GC-MS	EPA 8260B/ 8260C	m,p-Xylenes
GC-MS	EPA 8260B/ 8260C	Methylene Chloride
GC-MS	EPA 8260B/ 8260C	Methyl tert-Amyl Ether (TAME)
GC-MS	EPA 8260B/ 8260C	Methyl tert-Butyl Ether (MTBE)
GC-MS	EPA 8260B/ 8260C	Naphthalene
GC-MS	EPA 8260B/ 8260C	n-Butylbenzene
GC-MS	EPA 8260B/ 8260C	o-Xylene
GC-MS	EPA 8260B/ 8260C	para-Isopropyl Toluene
GC-MS	EPA 8260B/ 8260C	Propylbenzene
GC-MS	EPA 8260B/ 8260C	sec-Butylbenzene
GC-MS	EPA 8260B/ 8260C	Styrene
GC-MS	EPA 8260B/ 8260C	tert-Butyl Alcohol (TBA)
GC-MS	EPA 8260B/ 8260C	tert-Butylbenzene
GC-MS	EPA 8260B/ 8260C	Tetrachloroethene
GC-MS	EPA 8260B/ 8260C	Toluene
GC-MS	EPA 8260B/ 8260C	trans-1,2-Dichloroethene

Solid and Chemical Materials		
Technology	**Method**	**Analyte**
GC-MS	EPA 8260B/ 8260C	trans-1,3-Dichloropropene
GC-MS	EPA 8260B/ 8260C	Trichloroethene
GC-MS	EPA 8260B/ 8260C	Trichlorofluoromethane
GC-MS	EPA 8260B/ 8260C	Vinyl Acetate
GC-MS	EPA 8260B/ 8260C	Vinyl Chloride
GC-MS	EPA 8270C/ 8270D	1,2,4-Trichlorobenzene
GC-MS	EPA 8270C/ 8270D	1,2-Dichlorobenzene
GC-MS	EPA 8270C/ 8270D	1,3-Dichlorobenzene
GC-MS	EPA 8270C/ 8270D	1,4-Dichlorobenzene
GC-MS	EPA 8270C/ 8270D	2,4,5-Trichlorophenol
GC-MS	EPA 8270C/ 8270D	2,4,6-Trichlorophenol
GC-MS	EPA 8270C/ 8270D	2,4-Dichlorophenol
GC-MS	EPA 8270C/ 8270D	2,4-Dimethylphenol
GC-MS	EPA 8270C/ 8270D	2,4-Dinitrophenol
GC-MS	EPA 8270C/ 8270D	2,4-Dinitrotoluene
GC-MS	EPA 8270C/ 8270D	2,6-Dinitrotoluene
GC-MS	EPA 8270C/ 8270D	2-Chloronaphthalene
GC-MS	EPA 8270C/ 8270D	2-Chlorophenol
GC-MS	EPA 8270C/ 8270D	2-Methylnaphthalene
GC-MS	EPA 8270C/ 8270D	2-Methylphenol
GC-MS	EPA 8270C/ 8270D	2-Nitroaniline
GC-MS	EPA 8270C/ 8270D	2-Nitrophenol
GC-MS	EPA 8270C/ 8270D	3,3'-Dichlorobenzidine
GC-MS	EPA 8270C/ 8270D	3-Nitroaniline
GC-MS	EPA 8270C/ 8270D	4,6-Dinitro-2-methylphenol
GC-MS	EPA 8270C/ 8270D	4-Bromophenyl-phenylether
GC-MS	EPA 8270C/ 8270D	4-Chloro-3-methylphenol
GC-MS	EPA 8270C/ 8270D	4-Chloroaniline
GC-MS	EPA 8270C/ 8270D	4-Chlorophenyl-phenylether
GC-MS	EPA 8270C/ 8270D	4-Methylphenol
GC-MS	EPA 8270C/ 8270D	4-Nitroaniline
GC-MS	EPA 8270C/ 8270D	4-Nitrophenol
GC-MS	EPA 8270C/ 8270D	Acenaphthene
GC-MS	EPA 8270C/ 8270D	Acenaphthylene
GC-MS	EPA 8270C/ 8270D	Anthracene
GC-MS	EPA 8270C/ 8270D	Azobenzene
GC-MS	EPA 8270C/ 8270D	Benzo(a)anthracene
GC-MS	EPA 8270C/ 8270D	Benzo(a)pyrene
GC-MS	EPA 8270C/ 8270D	Benzo(b)fluoranthene
GC-MS	EPA 8270C/ 8270D	Benzo(g,h,i)perylene

Solid and Chemical Materials

Technology	Method	Analyte
GC-MS	EPA 8270C/ 8270D	Benzo(k)fluoranthene
GC-MS	EPA 8270C/ 8270D	Benzoic acid
GC-MS	EPA 8270C/ 8270D	Benzyl alcohol
GC-MS	EPA 8270C/ 8270D	bis(2-Chloroethoxy)methane
GC-MS	EPA 8270C/ 8270D	bis(2-Chloroethyl)ether
GC-MS	EPA 8270C/ 8270D	bis(2-Chloroisopropyl) ether
GC-MS	EPA 8270C/ 8270D	bis(2-Ethylhexyl)phthalate
GC-MS	EPA 8270C/ 8270D	Butylbenzylphthalate
GC-MS	EPA 8270C/ 8270D	Chrysene
GC-MS	EPA 8270C/ 8270D	Dibenz(a,h)anthracene
GC-MS	EPA 8270C/ 8270D	Dibenzofuran
GC-MS	EPA 8270C/ 8270D	Diethylphthalate
GC-MS	EPA 8270C/ 8270D	Dimethylphthalate
GC-MS	EPA 8270C/ 8270D	Di-n-butylphthalate
GC-MS	EPA 8270C/ 8270D	Di-n-octylphthalate
GC-MS	EPA 8270C/ 8270D	Fluoranthene
GC-MS	EPA 8270C/ 8270D	Fluorene
GC-MS	EPA 8270C/ 8270D	Hexachlorobenzene
GC-MS	EPA 8270C/ 8270D	Hexachlorobutadiene
GC-MS	EPA 8270C/ 8270D	Hexachlorocyclopentadiene
GC-MS	EPA 8270C/ 8270D	Hexachloroethane
GC-MS	EPA 8270C/ 8270D	Indeno(1,2,3-cd)pyrene
GC-MS	EPA 8270C/ 8270D	Isophorone
GC-MS	EPA 8270C/ 8270D	Naphthalene
GC-MS	EPA 8270C/ 8270D	Nitrobenzene
GC-MS	EPA 8270C/ 8270D	N-Nitrosodimethylamine
GC-MS	EPA 8270C/ 8270D	N-Nitroso-di-n-propylamine
GC-MS	EPA 8270C/ 8270D	N-Nitrosodiphenylamine
GC-MS	EPA 8270C/ 8270D	Pentachlorophenol
GC-MS	EPA 8270C/ 8270D	Phenanthrene
GC-MS	EPA 8270C/ 8270D	Phenol
GC-MS	EPA 8270C/ 8270D	Pyrene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	1,4-Dioxane
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Acenaphthylene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Acenaphthene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Anthracene

Solid and Chemical Materials

Technology	Method	Analyte
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Benzo(a)anthracene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Benzo(a)pyrene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Benzo(b)fluoranthene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Benzo(g,h,i)perylene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Benzo(k)fluoranthene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Chrysene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Dibenz(a,h)anthracene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Fluoranthene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Fluorene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Indeno(1,2,3-cd)pyrene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	1-Methylnaphthalene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	2-Methylnaphthalene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Naphthalene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Phenanthrene
GC-MS	EPA 8270C-SIM EPA 8270D-SIM	Pyrene
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	2-Amino-4,6-dinitrotoluene
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	4-Amino-2,6-dinitrotoluene
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	3,5-Dinitroaniline
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	1,3-Dinitrotoluene
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	2,4-Dinitrotoluene

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Solid and Chemical Materials		
Technology	**Method**	**Analyte**
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	2,6-Dinitrotoluene
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	HMX
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	RDX
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	Nitroglycerine
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	Nitrobenzene
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	2-Nitrotoluene
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	3-Nitrotoluene
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	4-Nitrotoluene
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	Pentaerythritol (PETN)
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	RDX
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	Tetryl
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	1,3,5-Trinitrobenzene
HPLC-UV	EPA 8330 EPA 8330A MOD EPA 8330B MOD	2,4,6-Trinitrotoluene
ICP-AES	EPA 6010B/ 6010C	Aluminum
ICP-AES	EPA 6010B/ 6010C	Antimony
ICP-AES	EPA 6010B/ 6010C	Arsenic
ICP-AES	EPA 6010B/ 6010C	Barium
ICP-AES	EPA 6010B/ 6010C	Beryllium
ICP-AES	EPA 6010B/ 6010C	Cadmium

Solid and Chemical Materials

Technology	Method	Analyte
ICP-AES	EPA 6010B/ 6010C	Calcium
ICP-AES	EPA 6010B/ 6010C	Chromium
ICP-AES	EPA 6010B/ 6010C	Cobalt
ICP-AES	EPA 6010B/ 6010C	Copper
ICP-AES	EPA 6010B/ 6010C	Iron
ICP-AES	EPA 6010B/ 6010C	Lead
ICP-AES	EPA 6010B/ 6010C	Magnesium
ICP-AES	EPA 6010B/ 6010C	Manganese
ICP-AES	EPA 6010B/ 6010C	Molybdenum
ICP-AES	EPA 6010B/ 6010C	Nickel
ICP-AES	EPA 6010B/ 6010C	Potassium
ICP-AES	EPA 6010B/ 6010C	Selenium
ICP-AES	EPA 6010B/ 6010C	Silver
ICP-AES	EPA 6010B/ 6010C	Sodium
ICP-AES	EPA 6010B/ 6010C	Thallium
ICP-AES	EPA 6010B/ 6010C	Vanadium
ICP-AES	EPA 6010B/ 6010C	Zinc
ICP-MS	EPA 6020/ 6020A	Aluminum
ICP-MS	EPA 6020/ 6020A	Antimony
ICP-MS	EPA 6020/ 6020A	Arsenic
ICP-MS	EPA 6020/ 6020A	Barium
ICP-MS	EPA 6020/ 6020A	Beryllium
ICP-MS	EPA 6020/ 6020A	Cadmium
ICP-MS	EPA 6020/ 6020A	Calcium
ICP-MS	EPA 6020/ 6020A	Chromium
ICP-MS	EPA 6020/ 6020A	Cobalt
ICP-MS	EPA 6020/ 6020A	Copper
ICP-MS	EPA 6020/ 6020A	Iron
ICP-MS	EPA 6020/ 6020A	Lead
ICP-MS	EPA 6020/ 6020A	Magnesium
ICP-MS	EPA 6020/ 6020A	Manganese
ICP-MS	EPA 6020/ 6020A	Molybdenum
ICP-MS	EPA 6020/ 6020A	Nickel
ICP-MS	EPA 6020/ 6020A	Potassium
ICP-MS	EPA 6020/ 6020A	Selenium
ICP-MS	EPA 6020/ 6020A	Silver
ICP-MS	EPA 6020/ 6020A	Sodium
ICP-MS	EPA 6020/ 6020A	Thallium
ICP-MS	EPA 6020/ 6020A	Vanadium
ICP-MS	EPA 6020/ 6020A	Zinc

Solid and Chemical Materials

Technology	Method	Analyte
CVAA	EPA 7471A/ 7471B	Mercury
Ion Chromatography	EPA 300.0 / 9056	Bromide
Ion Chromatography	EPA 300.0 / 9056	Chloride
Ion Chromatography	EPA 300.0 / 9056	Fluoride
Ion Chromatography	EPA 300.0 / 9056	Nitrate-N
Ion Chromatography	EPA 300.0 / 9056	Nitrite-N
Ion Chromatography	EPA 300.0 / 9056	Sulfate
Ion Selective Electrode	SM 4500-NH3 D	Ammonia
Ion Selective Electrode	EPA 9045C	pH
UV-VIS Spectrometer	SM 4500-CN E EPA 9010B/ 9014	Cyanide
UV-VIS Spectrometer	EPA 7196A	Hexavalent Chromium
Titration	EPA 9034	Sulfide
Titration	SM 4500-NH3 C	Total Kjeldahl Nitrogen (TKN)
Preparation	**Method**	**Analyte**
Purge & Trap	EPA 5035/ 5035A	Preparation for Volatiles in Soil
Extraction	EPA 3550B/ 3550C	Sonication Extraction for Semivolatile Organics (DRO, BNA, PCB, Pesticides, SIM)
Extraction	EPA 8330/ 8330A	Extraction of Nitroaromatics & Nitramines from Solids
Digestion	EPA 3060	Alkaline Digestion for Hexavalent Chromium
Digestion	EPA 3050B	Soil Digestion for ICP & ICP-MS Metals
Leaching Procedure	EPA 1311	TCLP – Toxicity Characteristic Leaching Procedure
Leaching Procedure	EPA 1312	SPLP – Synthetic Precipitation Leaching Procedure

Radiological - Soil

Technology	Method	Analyte
Gamma Spectroscopy	HASL 300 Ga-01	Actinium-228
Gamma Spectroscopy	HASL 300 Ga-01	Americium-241
Gamma Spectroscopy	HASL 300 Ga-01	Bismuth-212
Gamma Spectroscopy	HASL 300 Ga-01	Bismuth-214
Gamma Spectroscopy	HASL 300 Ga-01	Cesium-137
Gamma Spectroscopy	HASL 300 Ga-01	Cobalt-60
Gamma Spectroscopy	HASL 300 Ga-01	Europium-152
Gamma Spectroscopy	HASL 300 Ga-01	Europium-154
Gamma Spectroscopy	HASL 300 Ga-01	Lead-210
Gamma Spectroscopy	HASL 300 Ga-01	Lead-212
Gamma Spectroscopy	HASL 300 Ga-01	Lead-214
Gamma Spectroscopy	HASL 300 Ga-01	Proactinium-234M
Gamma Spectroscopy	HASL 300 Ga-01	Radium-226

Radiological - Soil		
Technology	**Method**	**Analyte**
Gamma Spectroscopy	HASL 300 Ga-01	Thallium-208
Gamma Spectroscopy	HASL 300 Ga-01	Thorium-232
Gamma Spectroscopy	HASL 300 Ga-01	Uranium-235

Air and Emissions		
Technology	**Method**	**Analyte**
GC-TCD	ASTM D1946	Carbon Dioxide
GC-TCD	ASTM D1946	Carbon Monoxide
GC-TCD	ASTM D1946	Helium
GC-TCD	ASTM D1946	Hydrogen
GC-TCD	ASTM D1946	Methane
GC-TCD	ASTM D1946	Nitrogen
GC-TCD	ASTM D1946	Oxygen
GC-MS	TO-15	1,1,1-Trichloroethane
GC-MS	TO-15	1,1,2,2-Tetrachloroethane
GC-MS	TO-15	1,1,2-Trichloroethane
GC-MS	TO-15	1,1-Dichloroethane
GC-MS	TO-15	1,1-Dichloroethene
GC-MS	TO-15	1,2,4-Trichlorobenzene
GC-MS	TO-15	1,2,4-Trimethylbenzene
GC-MS	TO-15	1,2-Dibromoethane
GC-MS	TO-15	1,2-Dichlorobenzene
GC-MS	TO-15	1,2-Dichloroethane
GC-MS	TO-15	1,2-Dichloropropane
GC-MS	TO-15	1,3,5-Trimethylbenzene
GC-MS	TO-15	1,3-Butadiene
GC-MS	TO-15	1,3-Dichlorobenzene
GC-MS	TO-15	1,4-Dichlorobenzene
GC-MS	TO-15	2-Butanone
GC-MS	TO-15	2-Hexanone
GC-MS	TO-15	4-Ethyltoluene
GC-MS	TO-15	4-Methyl-2-Pentanone
GC-MS	TO-15	Acetone
GC-MS	TO-15	Acrolein
GC-MS	TO-15	Benzene
GC-MS	TO-15	Benzyl chloride
GC-MS	TO-15	Bromodichloromethane
GC-MS	TO-15	Bromoform
GC-MS	TO-15	Bromomethane
GC-MS	TO-15	Carbon Disulfide
GC-MS	TO-15	Carbon Tetrachloride
GC-MS	TO-15	Chlorobenzene

LABORATORY ACCREDITATION BUREAU

Certificate # L2442

Air and Emissions		
Technology	**Method**	**Analyte**
GC-MS	TO-15	Chloroethane
GC-MS	TO-15	Chloroform
GC-MS	TO-15	Chloromethane
GC-MS	TO-15	cis-1,2-Dichloroethene
GC-MS	TO-15	cis-1,3-Dichloropropene
GC-MS	TO-15	Cyclohexane
GC-MS	TO-15	Dibromochloromethane
GC-MS	TO-15	Ethyl Acetate
GC-MS	TO-15	Ethylbenzene
GC-MS	TO-15	Freon 113
GC-MS	TO-15	Freon 114
GC-MS	TO-15	Freon 12
GC-MS	TO-15	Hexachlorobutadiene
GC-MS	TO-15	m,p-Xylenes
GC-MS	TO-15	Methylene Chloride
GC-MS	TO-15	MTBE
GC-MS	TO-15	Naphthalene
GC-MS	TO-15	n-Heptane
GC-MS	TO-15	n-Hexane
GC-MS	TO-15	o-Xylene
GC-MS	TO-15	Propylene
GC-MS	TO-15	Styrene
GC-MS	TO-15	Tetrachloroethene
GC-MS	TO-15	Tetrahydrofuran
GC-MS	TO-15	Toluene
GC-MS	TO-15	trans-1,2-Dichloroethene
GC-MS	TO-15	trans-1,3-Dichloropropene
GC-MS	TO-15	Trichloroethene
GC-MS	TO-15	Trichlorofluoromethane
GC-MS	TO-15	Vinyl Acetate
GC-MS	TO-15	Vinyl Chloride

Notes:

1) This laboratory offers commercial testing service.

Approved by: R.D.L. ______________________ Date: January 7, 2016

R. Douglas Leonard
Chief Technical Officer

Issued: 12/23/15 Revised: 1/7/16

American Association for Laboratory Accreditation

Accredited DoD ELAP Laboratory

A2LA has accredited

CURTIS & TOMPKINS, LLC

Berkeley, CA

for technical competence in the field of

Environmental Testing

In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 4.2 of the DoD Quality System Manual for Environmental Laboratories (QSM); accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Presented this 5th day of March 2014.

President & CEO
For the Accreditation Council
Certificate Number 2943.01
Valid to February 29, 2016

For the tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

OREGON

Environmental Laboratory Accreditation Program

NELAP Recognized

Curtis & Tompkins, Ltd.

4044

2323 Fifth St.

Berkeley,CA 94710

IS GRANTED APPROVAL BY ORELAP UNDER THE 2009 TNI STANDARDS, TO PERFORM ANALYSES ON ENVIRONMENTAL SAMPLES IN MATRICES AS LISTED BELOW :

Air	***Drinking Water***	***Non Potable Water***	***Solids and Chem. Waste***	***Tissue***
	Chemistry	Chemistry	Chemistry	
			Radiochemistry	
			Toxicity Testing	

AND AS RECORDED IN THE LIST OF APPROVED ANALYTES, METHODS, ANALYTICAL TECHNIQUES, AND FIELDS OF TESTING ISSUED CONCURRENTLY WITH THIS CERTIFICATE AND REVISED AS NECESSARY.

ACCREDITED STATUS DEPENDS ON SUCCESSFUL ONGOING PARTICIPATION IN THE PROGRAM AND CONTINUED COMPLIANCE WITH THE STANDARDS.

CUSTOMERS ARE URGED TO VERIFY THE LABORATORY'S CURRENT ACCREDITATION STATUS IN OREGON.

Gary K Ward

Gary K. Ward, MS
Oregon State Public Health Laboratory
ORELAP Administrator
3150 NW. 229th Ave, Suite 100
Hillsboro, OR 97124

ISSUE DATE: 01/30/2016

EXPIRATION DATE: 01/29/2017

Certificate No: 4044 - 003

Oregon

Environmental Laboratory Accreditation Program

Department of Agriculture, Laboratory Division
Department of Environmental Quality, Laboratory Division
Oregon Health Authority, Public Health Division

NELAP Recognized

ORELAP Fields of Accreditation

ORELAP ID: 4044
EPA CODE: CA00128
Certificate: 4044 - 003

Curtis & Tompkins, Ltd.
2323 Fifth St.
Berkeley CA 94710

Issue Date: 01/30/2016 ***Expiration Date:*** 01/29/2017

As of 01/30/2016 ***this list supercedes all previous lists for this certificate number.***
Customers. Please verify the current accreditation standing with ORELAP.

MATRIX : Drinking Water

Reference	Code	Description
EPA 200.7 4.4	**10013806**	**ICP - metals**

Analyte Code	*Analyte*
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1055	Copper
1760	Hardness (calc.)
1070	Iron
1085	Magnesium
1090	Manganese
1105	Nickel
1125	Potassium
1150	Silver
1155	Sodium
1190	Zinc

Reference	Code	Description
EPA 200.8 5.4	**10014605**	**Metals by ICP-MS**

Analyte Code	*Analyte*
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1040	Chromium
1055	Copper
1075	Lead
1090	Manganese
1105	Nickel
1140	Selenium
1150	Silver
1165	Thallium
1190	Zinc

Reference	Code	Description
EPA 245.1 3	**10036609**	**Mercury by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

ORELAP Fields of Accreditation

ORELAP ID: 4044
EPA CODE: CA00128
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EPA 300.0 2.1 **10053200** **Methods for the Determination of Inorganic Substances in Environmental Samples**

Analyte Code	Analyte
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1840	Nitrite as N
2000	Sulfate

EPA 314 **10055604** **Perchlorate in Drinking Water by Ion Chromatography**

Analyte Code	Analyte
1895	Perchlorate

SM 2320 B 20th ED **20045209** **Alkalinity by Titration**

Analyte Code	Analyte
1505	Alkalinity as CaCO3

SM 2340 B 20th ED **20046202** **Hardness by calculation**

Analyte Code	Analyte
1755	Total hardness as CaCO3

SM 2510 B 20th ED **20048208** **Conductivity by Probe**

Analyte Code	Analyte
1610	Conductivity

SM 2540 C 20th ED **20050004** **Total Dissolved Solids**

Analyte Code	Analyte
1955	Residue-filterable (TDS)

SM 4500-Cl G 21st ED **20081407** **Chlorine by DPD Colorimetric Method**

Analyte Code	Analyte
1940	Total residual chlorine

SM 4500-CN E-1999 **20096417** **Cyanide by Colorimetric Method**

Analyte Code	Analyte
1645	Total cyanide

SM 4500-P E 21st ED **20124009** **Phosphorus by Ascorbic Acid Method**

Analyte Code	Analyte
1870	Orthophosphate as P

SM 5540 C 21st ED **20144803** **Surfactants by Anionic Surfactants as MBAS**

Analyte Code	Analyte
2025	Surfactants - MBAS

ORELAP Fields of Accreditation

ORELAP ID: 4044
EPA CODE: CA00128
Certificate: 4044 - 003

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MATRIX : Non-Potable Water

Reference	Code	Description
EPA 1664A (HEM)	**10127807**	**N-Hexane Extractable Material (Oil and Grease) by Extraction and Gravimetry**

Analyte Code	Analyte
1803	n-Hexane Extractable Material (O&G)

Reference	Code	Description
EPA 200.7 4.4	**10013806**	**ICP - metals**

Analyte Code	Analyte
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1760	Hardness (calc.)
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium
1190	Zinc

Reference	Code	Description
EPA 200.8 5.4	**10014605**	**Metals by ICP-MS**

Analyte Code	Analyte
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver

ORELAP Fields of Accreditation

ORELAP ID: 4044
EPA CODE: CA00128
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Analyte Code	*Analyte*
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 245.1 3 **10036609** **Mercury by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

EPA 300.0 2.1 **10053200** **Methods for the Determination of Inorganic Substances in Environmental Samples**

Analyte Code	*Analyte*
1540	Bromide
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1840	Nitrite as N
2000	Sulfate

EPA 420.1 **10079206** **Phenolics - Spectrophotometric, manual.**

Analyte Code	*Analyte*
1905	Total phenolics

EPA 6010B **10155609** **ICP - AES**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 6010C **10155803** **ICP - AES**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium

Analyte Code	Analyte
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 6020 **10156000** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	Analyte
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 6020A **10156408** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	Analyte
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead

ORELAP Fields of Accreditation

ORELAP ID: 4044

EPA CODE: CA00128

Certificate: 4044 - 003

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Analyte Code	*Analyte*
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 608 **10103603** **Organochlorine Pesticides & PCBs by GC/ECD**

Analyte Code	*Analyte*
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
7810	Methoxychlor
8250	Toxaphene (Chlorinated camphene)

EPA 624 **10107207** **Volatile Organic Compounds by purge and trap GC/MS**

Analyte Code	*Analyte*
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
4500	2-Chloroethyl vinyl ether
4375	Benzene
4395	Bromodichloromethane
4400	Bromoform

ORELAP Fields of Accreditation

ORELAP ID: 4044
EPA CODE: CA00128
Certificate: 4044 - 003

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Analyte Code	*Analyte*
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4680	cis-1,3-Dichloropropene
4765	Ethylbenzene
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
4975	Methylene chloride (Dichloromethane)
5115	Tetrachloroethylene (Perchloroethylene)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5235	Vinyl chloride

EPA 625 **10300002** **Base/Neutrals and Acids by GC/MS**

Analyte Code	*Analyte*
5155	1,2,4-Trichlorobenzene
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6490	2-Nitrophenol
5945	3,3'-Dichlorobenzidine
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5825	4-Chlorophenyl phenylether
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5780	bis(2-Chloroisopropyl) ether
5670	Butyl benzyl phthalate
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
5895	Dibenz(a,h) anthracene
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene

Analyte Code	Analyte
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6605	Pentachlorophenol
6615	Phenanthrene
6625	Phenol
6665	Pyrene

EPA 7196A **10162400** **Chromium Hexavalent colorimetric**

Analyte Code	Analyte
1045	Chromium VI

EPA 7199 **10163005** **Determination of Hexavalent Chromium in Drinking Water, Groundwater and Industrial Wastewater Effluents by Ion Chromatography**

Analyte Code	Analyte
1045	Chromium VI

EPA 7470A **10165807** **Mercury in Liquid Waste by Cold Vapor Atomic Absorption**

Analyte Code	Analyte
1095	Mercury

EPA 8015B **10173601** **Non-halogenated organics using GC/FID**

Analyte Code	Analyte
9369	Diesel range organics (DRO)
4750	Ethanol
9408	Gasoline range organics (GRO)
4930	Methanol

EPA 8015D **10305609** **Nonhalogenated Organics Using GC/FID**

Analyte Code	Analyte
9369	Diesel range organics (DRO)
4750	Ethanol
9408	Gasoline range organics (GRO)
4930	Methanol

EPA 8021B **10174808** **Aromatic and Halogenated Volatiles by GC with PID and/or ECD Purge & Trap**

Analyte Code	Analyte
4375	Benzene
4765	Ethylbenzene
5240	m+p-xylene
5000	Methyl tert-butyl ether (MTBE)
5250	o-Xylene
5140	Toluene
5260	Xylene (total)

EPA 8081A **10178606** **Organochlorine Pesticides by GC/ECD**

Analyte Code	Analyte
7355	4,4'-DDD
7360	4,4'-DDE

ORELAP Fields of Accreditation

ORELAP ID: 4044
EPA CODE: CA00128
Certificate: 4044 - 003

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Analyte Code	Analyte
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
7810	Methoxychlor
8250	Toxaphene (Chlorinated camphene)

EPA 8081B **10178800** **Organochlorine Pesticides by GC/ECD**

Analyte Code	Analyte
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
7810	Methoxychlor
8250	Toxaphene (Chlorinated camphene)

EPA 8082 **10179007** **Polychlorinated Biphenyls (PCBs) by GC/ECD**

Analyte Code	Analyte
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)

ORELAP Fields of Accreditation

ORELAP ID: 4044
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EPA 8082A **10179201** **Polychlorinated Biphenyls (PCBs) by GC/ECD**

Analyte Code	*Analyte*
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)

EPA 8260B **10184802** **Volatile Organic Compounds by purge and trap GC/MS**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4535	2-Chlorotoluene
4860	2-Hexanone (MBK)
4540	4-Chlorotoluene
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4580	Dibromochloropropane
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4900	Isopropylbenzene
4950	Methyl bromide (Bromomethane)

ORELAP Fields of Accreditation

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Analyte Code	Analyte
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4435	n-Butylbenzene
5090	n-Propylbenzene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4420	tert-Butyl alcohol
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride
5260	Xylene (total)

EPA 8260C **10307003** **Volatile Organics: GC/MS (capillary column)**

Analyte Code	Analyte
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4535	2-Chlorotoluene
4860	2-Hexanone (MBK)
4540	4-Chlorotoluene
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform

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Analyte Code	*Analyte*
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4580	Dibromochloropropane
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4900	Isopropylbenzene
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4435	n-Butylbenzene
5090	n-Propylbenzene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4420	tert-Butyl alcohol
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride
5260	Xylene (total)

EPA 8270C **10185805** **Semivolatile Organic compounds by GC/MS**

Analyte Code	*Analyte*
5155	1,2,4-Trichlorobenzene
4610	1,2-Dichlorobenzene
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6005	2,6-Dichlorophenol
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6460	2-Nitroaniline
6490	2-Nitrophenol
5945	3,3'-Dichlorobenzidine
6465	3-Nitroaniline
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6410	4-Methylphenol (p-Cresol)

ORELAP Fields of Accreditation

ORELAP ID: 4044
EPA CODE: CA00128
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Analyte Code	Analyte
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5780	bis(2-Chloroisopropyl) ether
5670	Butyl benzyl phthalate
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6605	Pentachlorophenol
6615	Phenanthrene
6625	Phenol
6665	Pyrene

EPA 8270D **10186002** **Semivolatile Organic compounds by GC/MS**

Analyte Code	Analyte
5155	1,2,4-Trichlorobenzene
4610	1,2-Dichlorobenzene
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6005	2,6-Dichlorophenol
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)

ORELAP Fields of Accreditation

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Analyte Code	Analyte
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6460	2-Nitroaniline
6490	2-Nitrophenol
5945	3,3'-Dichlorobenzidine
6465	3-Nitroaniline
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6410	4-Methylphenol (p-Cresol)
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5780	bis(2-Chloroisopropyl) ether
5670	Butyl benzyl phthalate
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6605	Pentachlorophenol
6610	Phenacetin
6625	Phenol
6665	Pyrene

EPA 8310 **10187607** **Polynuclear Aromatic Hydrocarbons by HPLC/UV-VIS**

Analyte Code	Analyte
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene

Analyte Code	Analyte
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5855	Chrysene
5895	Dibenz(a,h) anthracene
6265	Fluoranthene
6270	Fluorene
6315	Indeno(1,2,3-cd) pyrene
5005	Naphthalene
6615	Phenanthrene
6665	Pyrene

EPA 8330 **10189807** **Nitroaromatics and Nitramines by HPLC/UV-VIS**

Analyte Code	Analyte
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)
6160	1,3-Dinitrobenzene (1,3-DNB)
9651	2,4,6-Trinitrotoluene (2,4,6-TNT)
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
9303	2-Amino-4,6-dinitrotoluene (2-am-dnt)
9507	2-Nitrotoluene
9510	3-Nitrotoluene
9306	4-Amino-2,6-dinitrotoluene (4-am-dnt)
9513	4-Nitrotoluene
6415	Methyl-2,4,6-trinitrophenylnitramine (tetryl)
5015	Nitrobenzene
9522	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)

EPA 8330A **10190008** **Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC)**

Analyte Code	Analyte
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)
6160	1,3-Dinitrobenzene (1,3-DNB)
9651	2,4,6-Trinitrotoluene (2,4,6-TNT)
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
9303	2-Amino-4,6-dinitrotoluene (2-am-dnt)
9507	2-Nitrotoluene
9510	3-Nitrotoluene
9306	4-Amino-2,6-dinitrotoluene (4-am-dnt)
9513	4-Nitrotoluene
6415	Methyl-2,4,6-trinitrophenylnitramine (tetryl)
5015	Nitrobenzene
9522	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)

EPA 9040B **10197203** **pH Electrometric Measurement**

Analyte Code	Analyte
1900	pH

SM 2130 B 21st ED **20042608** **Turbidity by Nephelometric Method**

Analyte Code	Analyte
2055	Turbidity

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SM 2320 B 20th ED **20045209** **Alkalinity by Titration**

Analyte Code	*Analyte*
1505	Alkalinity as CaCO3

SM 2340 B 20th ED **20046202** **Hardness by calculation**

Analyte Code	*Analyte*
1755	Total hardness as CaCO3

SM 2510 B 20th ED **20048208** **Conductivity by Probe**

Analyte Code	*Analyte*
1610	Conductivity

SM 2540 C 20th ED **20050004** **Total Dissolved Solids**

Analyte Code	*Analyte*
1955	Residue-filterable (TDS)

SM 2540 D 20th ED **20050800** **Total Suspended Solids**

Analyte Code	*Analyte*
1960	Residue-nonfilterable (TSS)

SM 4500-Cl G 21st ED **20081407** **Chlorine by DPD Colorimetric Method**

Analyte Code	*Analyte*
1940	Total residual chlorine

SM 4500-CN E-1999 **20096417** **Cyanide by Colorimetric Method**

Analyte Code	*Analyte*
1645	Total cyanide

SM 4500-H+ B 21st ED **20105004** **pH Value by Electrometric Method .**

Analyte Code	*Analyte*
1900	pH

SM 4500-NH3 C 18th ED **20023603** **Ammonia Nitrogen by Nesslerization**

Analyte Code	*Analyte*
1790	Kjeldahl nitrogen

SM 4500-NH3 D 20th ED **20109006** **Ammonia by Selective Ion Probe**

Analyte Code	*Analyte*
1515	Ammonia as N

SM 4500-P E 21st ED **20124009** **Phosphorus by Ascorbic Acid Method**

Analyte Code	*Analyte*
1870	Orthophosphate as P
1910	Phosphorus, total

SM 4500-S2¯ D 21st ED **20125604** **Sulfide by Methylene Blue Method**

Analyte Code	*Analyte*
2005	Sulfide

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SM 4500-SiO2 C 20th ED **20128205** **Silicon by Molybdosilicate Method**

Analyte Code	*Analyte*
1990	Silica as SiO2

SM 5210 B 21st ED **20135006** **Biochemical Oxygen Demand, 5-Day (BOD5)**

Analyte Code	*Analyte*
1530	Biochemical oxygen demand

SM 5220 D 20th ED **20136407** **Chemical Oxygen Demand by Closed Reflux and Colorimetric Determination**

Analyte Code	*Analyte*
1565	Chemical oxygen demand

SM 5310 C 21st ED **20138607** **TOC by Persulfate-Ultraviolet or Heated-Persulfate Oxidation Method**

Analyte Code	*Analyte*
2040	Total organic carbon

SM 5540 C 21st ED **20144803** **Surfactants by Anionic Surfactants as MBAS**

Analyte Code	*Analyte*
2025	Surfactants - MBAS

ORELAP Fields of Accreditation

ORELAP ID: 4044
EPA CODE: CA00128
Certificate: 4044 - 003

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MATRIX : Solids

Reference	Code	Description
CA Title 22 WET 1985	**90017235**	**CA Waste Extraction Test (WET)**

Analyte Code	Analyte
8031	Extraction/Preparation

Reference	Code	Description
EPA 1010	**10116606**	**Pensky-Martens Closed-Cup Method for Determining Ignitability**

Analyte Code	Analyte
1780	Ignitability

Reference	Code	Description
EPA 1010A	**10234807**	**Pensky-Martens Closed-Cup Method for Determining Ignitability**

Analyte Code	Analyte
1780	Ignitability

Reference	Code	Description
EPA 1110	**10118000**	**Corrosivity Toward Steel**

Analyte Code	Analyte
1615	Corrosivity

Reference	Code	Description
EPA 1311	**10118806**	**Toxicity Characteristic Leaching Procedure**

Analyte Code	Analyte
8031	Extraction/Preparation

Reference	Code	Description
EPA 1312	**10119003**	**Synthetic Precipitation Leaching Procedure**

Analyte Code	Analyte
8031	Extraction/Preparation

Reference	Code	Description
EPA 6010B	**10155609**	**ICP - AES**

Analyte Code	Analyte
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

ORELAP Fields of Accreditation

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EPA 6010C **10155803** **ICP - AES**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 6020 **10156000** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 6020A **10156408** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium

ORELAP Fields of Accreditation

ORELAP ID: 4044
EPA CODE: CA00128
Certificate: 4044 - 003

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Analyte Code	Analyte
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 7196A **10162400** **Chromium Hexavalent colorimetric**

Analyte Code	Analyte
1045	Chromium VI

EPA 7471A **10166208** **Mercury in Solid Waste by Cold Vapor Atomic Absorption**

Analyte Code	Analyte
1095	Mercury

EPA 7471B **10166402** **Mercury by Cold Vapor Atomic Absorption**

Analyte Code	Analyte
1095	Mercury

EPA 8015B **10173601** **Non-halogenated organics using GC/FID**

Analyte Code	Analyte
9369	Diesel range organics (DRO)
4750	Ethanol
9408	Gasoline range organics (GRO)
4930	Methanol

EPA 8015D **10305609** **Nonhalogenated Organics Using GC/FID**

Analyte Code	Analyte
9369	Diesel range organics (DRO)
4750	Ethanol
9408	Gasoline range organics (GRO)
4930	Methanol

EPA 8021B **10174808** **Aromatic and Halogenated Volatiles by GC with PID and/or ECD Purge & Trap**

Analyte Code	Analyte
4375	Benzene
4765	Ethylbenzene
5240	m+p-xylene
5000	Methyl tert-butyl ether (MTBE)
5250	o-Xylene
5140	Toluene
5260	Xylene (total)

ORELAP Fields of Accreditation

ORELAP ID: 4044
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EPA 8081A **10178606** **Organochlorine Pesticides by GC/ECD**

Analyte Code	Analyte
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
7810	Methoxychlor
8250	Toxaphene (Chlorinated camphene)

EPA 8081B **10178800** **Organochlorine Pesticides by GC/ECD**

Analyte Code	Analyte
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
7810	Methoxychlor
8250	Toxaphene (Chlorinated camphene)

EPA 8082 **10179007** **Polychlorinated Biphenyls (PCBs) by GC/ECD**

Analyte Code	Analyte
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)

ORELAP Fields of Accreditation

ORELAP ID: 4044
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Analyte Code	Analyte
8910	Aroclor-1260 (PCB-1260)

EPA 8082A **10179201** **Polychlorinated Biphenyls (PCBs) by GC/ECD**

Analyte Code	Analyte
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)

EPA 8260B **10184802** **Volatile Organic Compounds by purge and trap GC/MS**

Analyte Code	Analyte
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4535	2-Chlorotoluene
4860	2-Hexanone (MBK)
4540	4-Chlorotoluene
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4580	Dibromochloropropane
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene

Analyte Code	Analyte
4900	Isopropylbenzene
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4435	n-Butylbenzene
5090	n-Propylbenzene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4420	tert-Butyl alcohol
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride
5260	Xylene (total)

EPA 8260C **10307003** **Volatile Organics: GC/MS (capillary column)**

Analyte Code	Analyte
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4535	2-Chlorotoluene
4860	2-Hexanone (MBK)
4540	4-Chlorotoluene
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane

Analyte Code	Analyte
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4580	Dibromochloropropane
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4900	Isopropylbenzene
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4435	n-Butylbenzene
5090	n-Propylbenzene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4420	tert-Butyl alcohol
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride
5260	Xylene (total)

EPA 8270C **10185805** **Semivolatile Organic compounds by GC/MS**

Analyte Code	Analyte
5155	1,2,4-Trichlorobenzene
4610	1,2-Dichlorobenzene
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6005	2,6-Dichlorophenol
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6460	2-Nitroaniline
6490	2-Nitrophenol
5945	3,3'-Dichlorobenzidine
6465	3-Nitroaniline
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline

ORELAP Fields of Accreditation

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Analyte Code	Analyte
5825	4-Chlorophenyl phenylether
6410	4-Methylphenol (p-Cresol)
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5780	bis(2-Chloroisopropyl) ether
5670	Butyl benzyl phthalate
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6605	Pentachlorophenol
6615	Phenanthrene
6625	Phenol
6665	Pyrene

EPA 8270D **10186002** **Semivolatile Organic compounds by GC/MS**

Analyte Code	Analyte
5155	1,2,4-Trichlorobenzene
4610	1,2-Dichlorobenzene
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6005	2,6-Dichlorophenol
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene

ORELAP Fields of Accreditation

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Analyte Code	Analyte
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6460	2-Nitroaniline
6490	2-Nitrophenol
5945	3,3'-Dichlorobenzidine
6465	3-Nitroaniline
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6410	4-Methylphenol (p-Cresol)
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5780	bis(2-Chloroisopropyl) ether
5670	Butyl benzyl phthalate
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
6070	Diethyl phthalate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6605	Pentachlorophenol
6610	Phenacetin
6625	Phenol
6665	Pyrene

EPA 8310 **10187607** **Polynuclear Aromatic Hydrocarbons by HPLC/UV-VIS**

Analyte Code	Analyte
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene

ORELAP Fields of Accreditation

ORELAP ID: 4044
EPA CODE: CA00128
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Analyte Code	Analyte
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5855	Chrysene
5895	Dibenz(a,h) anthracene
6265	Fluoranthene
6270	Fluorene
6315	Indeno(1,2,3-cd) pyrene
5005	Naphthalene
6615	Phenanthrene
6665	Pyrene

EPA 8330 **10189807** **Nitroaromatics and Nitramines by HPLC/UV-VIS**

Analyte Code	Analyte
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)
6160	1,3-Dinitrobenzene (1,3-DNB)
9651	2,4,6-Trinitrotoluene (2,4,6-TNT)
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
9303	2-Amino-4,6-dinitrotoluene (2-am-dnt)
9507	2-Nitrotoluene
9510	3-Nitrotoluene
9306	4-Amino-2,6-dinitrotoluene (4-am-dnt)
9513	4-Nitrotoluene
6415	Methyl-2,4,6-trinitrophenylnitramine (tetryl)
5015	Nitrobenzene
9522	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)

EPA 8330A **10190008** **Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC)**

Analyte Code	Analyte
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)
6160	1,3-Dinitrobenzene (1,3-DNB)
9651	2,4,6-Trinitrotoluene (2,4,6-TNT)
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
9303	2-Amino-4,6-dinitrotoluene (2-am-dnt)
9507	2-Nitrotoluene
9510	3-Nitrotoluene
9306	4-Amino-2,6-dinitrotoluene (4-am-dnt)
9513	4-Nitrotoluene
6415	Methyl-2,4,6-trinitrophenylnitramine (tetryl)
5015	Nitrobenzene
9522	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)

EPA 8330B **10308006** **Nitroaromatics, Nitramines and Nitrate Esters by High Performance Liquid Chromatography (HPLC)**

Analyte Code	Analyte
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)
6160	1,3-Dinitrobenzene (1,3-DNB)
9651	2,4,6-Trinitrotoluene (2,4,6-TNT)
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
9303	2-Amino-4,6-dinitrotoluene (2-am-dnt)
9507	2-Nitrotoluene

ORELAP Fields of Accreditation

ORELAP ID: 4044
EPA CODE: CA00128
Certificate: 4044 - 003

Curtis & Tompkins, Ltd.

2323 Fifth St.
Berkeley CA 94710

Issue Date: 01/30/2016 ***Expiration Date:*** 01/29/2017

As of 01/30/2016 ***this list supercedes all previous lists for this certificate number. Customers. Please verify the current accreditation standing with ORELAP.***

Analyte Code	*Analyte*
6150	3,5-Dinitroaniline
9510	3-Nitrotoluene
9306	4-Amino-2,6-dinitrotoluene (4-am-dnt)
9513	4-Nitrotoluene
6415	Methyl-2,4,6-trinitrophenylnitramine (tetryl)
5015	Nitrobenzene
6485	Nitroglycerin
9522	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
9558	Pentaerythritoltetranitrate (PETN)
9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)

EPA 9014 **10193803** **Titrimetric and Manual Spectrophotometric Determinative Methods for Cyanide**

Analyte Code	*Analyte*
1635	Cyanide

EPA 9034 **10196006** **Titrimetric Procedure for Acid-Soluble and Acid-Insoluble Sulfides**

Analyte Code	*Analyte*
2005	Sulfide

EPA 9045C **10198400** **Soil and Waste pH**

Analyte Code	*Analyte*
1900	pH

EPA SW-846 Chapter 7.3 **10245702** **Characteristic Determination - Reactivity**

Analyte Code	*Analyte*
1923	Reactive Cyanide
1925	Reactive sulfide

HASL 300 Ga-01-R sec 4.5.2.3 28th ED **90000401** **Gamma Radioassay**

Analyte Code	*Analyte*
2700	Actinium-228
2755	Americium-241
2772	Bismuth-212
2773	Bismuth-214
2805	Cesium-137
2815	Cobalt-60
1068	Europium-152
1069	Europium-154
2900	Lead-210
2902	Lead-212
2903	Lead-214
2952	Protactinium-234
2965	Radium-226
1166	Thallium-208
3033	Thorium-232
3037	Uranium-235

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

VISTA ANALYTICAL LABORATORY
1104 Windfield Way
El Dorado Hills, CA 95762
Martha Maier Phone: 916-673-1520
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ENVIRONMENTAL

Valid To: September 30, 2017 Certificate Number: 3091.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2009 NELAC Standard, and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.0 of the DoD Quality Systems Manual for Environmental Laboratories) accreditation is granted to this laboratory to perform recognized EPA methods using the

Peter Mlnyer

following testing technologies and in the analyte categories identified below:

Testing Technologies

High Resolution Gas Chromatography / Mass Spectrometry

Parameter/Analyte	**Potable Water**	**Nonpotable Water**	**Solid Hazardous Waste**	**Tissue**
Dioxins/Furans				
2,3,7,8-Tetrachlorodibenzo-p-dioxin	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
2,3,7,8-Tetrachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,7,8-Pentachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
2,3,4,7,8-Pentachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,7,8-Hexachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,6,7,8-Hexachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
2,3,4,6,7,8-Hexachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,7,8,9-Hexachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,6,7,8-Heptachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,7,8,9-Heptachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	Tissue
Total Tetrachlorodibenzo-p-dioxin	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Pentachlorodibenzo-p-dioxin	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Hexachlorodibenzo-p-dioxin	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Dioxins/Furans				
Total Heptachlorodibenzo-p-dioxin	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Tetrachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Pentachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Hexachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
Total Heptachlorodibenzofuran	-----------------------	EPA 1613B/8290	EPA 1613B/8290	EPA 1613B/8290
PCBs				
2-Chlorobiphenyl (1)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3-Chlorobiphenyl (2)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
4-Chlorobiphenyl (3)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2'-Dichlorobiphenyl (4)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3-Dichlorobiphenyl (5)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3'-Dichlorobiphenyl (6)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4-Dichlorobiphenyl (7)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4'-Dichlorobiphenyl (8)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,5-Dichlorobiphenyl (9)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,6-Dichlorobiphenyl (10)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3'-Dichlorobiphenyl (11)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4-Dichlorobiphenyl (12)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4'-Dichlorobiphenyl (13)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,5-Dichlorobiphenyl (14)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
4,4'-Dichlorobiphenyl (15)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3-Trichlorobiphenyl (16)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4-Trichlorobiphenyl (17)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',5-Trichlorobiphenyl (18)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',6-Trichlorobiphenyl (19)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3'-Trichlorobiphenyl (20)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	Tissue
2,3,4-Trichlorobiphenyl (21)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4'-Trichlorobiphenyl (22)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,5-Trichlorobiphenyl (23)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,6-Trichlorobiphenyl (24)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4-Trichlorobiphenyl (25)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',5-Trichlorobiphenyl (26)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',6-Trichlorobiphenyl (27)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4,4'-Trichlorobiphenyl (28)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4,5-Trichlorobiphenyl (29)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4,6-Trichlorobiphenyl (30)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4',5-Trichlorobiphenyl (31)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4',6-Trichlorobiphenyl (32)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,4-Trichlorobiphenyl (33)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,5-Trichlorobiphenyl (34)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4-Trichlorobiphenyl (35)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',5-Trichlorobiphenyl (36)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4,4'-Trichlorobiphenyl (37)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4,5-Trichlorobiphenyl (38)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4',5-Trichlorobiphenyl (39)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3'-Tetrachlorobiphenyl (40)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4-Tetrachlorobiphenyl (41)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4'-Tetrachlorobiphenyl (42)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5-Tetrachlorobiphenyl (43)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5'-Tetrachlorobiphenyl (44)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,6-Tetrachlorobiphenyl (45)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	Tissue
2,2',3,6'-Tetrachlorobiphenyl (46)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4'-Tetrachlorobiphenyl (47)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,5-Tetrachlorobiphenyl (48)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,5'-Tetrachlorobiphenyl (49)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,6-Tetrachlorobiphenyl (50)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,6'-Tetrachlorobiphenyl (51)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',5,5'-Tetrachlorobiphenyl (52)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',5,6'-Tetrachlorobiphenyl (53)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',6,6'-Tetrachlorobiphenyl (54)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4'-Tetrachlorobiphenyl (55)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4'-Tetrachlorobiphenyl (56)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5-Tetrachlorobiphenyl (57)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5'-Tetrachlorobiphenyl (58)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',6-Tetrachlorobiphenyl (59)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,4'-Tetrachlorobiphenyl (60)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,5-Tetrachlorobiphenyl (61)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,6-Tetrachlorobiphenyl (62)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4',5-Tetrachlorobiphenyl (63)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4',6-Tetrachlorobiphenyl (64)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,5,6-Tetrachlorobiphenyl (65)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4'-Tetrachlorobiphenyl (66)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,5-Tetrachlorobiphenyl (67)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,5'-Tetrachlorobiphenyl (68)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,6-Tetrachlorobiphenyl (69)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4',5-Tetrachlorobiphenyl (70)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	Tissue
2,3',4',6-Tetrachlorobiphenyl (71)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',5,5'-Tetrachlorobiphenyl (72)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',5',6-Tetrachlorobiphenyl (73)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4,4',5-Tetrachlorobiphenyl (74)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,4,4',6-Tetrachlorobiphenyl (75)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,4,5-Tetrachlorobiphenyl (76)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,4'-Tetrachlorobiphenyl (77)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,5-Tetrachlorobiphenyl (78)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,5'-Tetrachlorobiphenyl (79)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',5,5'-Tetrachlorobiphenyl (80)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,4,4',5-Tetrachlorobiphenyl (81)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4-Pentachlorobiphenyl (82)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5-Pentachlorobiphenyl (83)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',6-Pentachlorobiphenyl (84)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4'-Pentachlorobiphenyl (85)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5-Pentachlorobiphenyl (86)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5'-Pentachlorobiphenyl (87)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,6-Pentachlorobiphenyl (88)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,6'-Pentachlorobiphenyl (89)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5-Pentachlorobiphenyl (90)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',6-Pentachlorobiphenyl (91)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,5'-Pentachlorobiphenyl (92)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,6-Pentachlorobiphenyl (93)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,6'-Pentachlorobiphenyl (94)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5',6-Pentachlorobiphenyl (95)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	Tissue
2,2',3,6,6'-Pentachlorobiphenyl (96)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3',4,5-Pentachlorobiphenyl (97)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3',4,6-Pentachlorobiphenyl (98)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4',5-Pentachlorobiphenyl (99)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4',6-Pentachlorobiphenyl (100)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,5,5'-Pentachlorobiphenyl (101)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,5,6'-Pentachlorobiphenyl (102)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,5,'6-Pentachlorobiphenyl (103)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,6,6'-Pentachlorobiphenyl (104)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4'-Pentachlorobiphenyl (105)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5-Pentachlorobiphenyl (106)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',5-Pentachlorobiphenyl (107)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5'-Pentachlorobiphenyl (108)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,6-Pentachlorobiphenyl (109)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',6-Pentachlorobiphenyl (110)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5,5'-Pentachlorobiphenyl (111)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5,6-Pentachlorobiphenyl (112)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5',6-Pentachlorobiphenyl (113)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,4',5-Pentachlorobiphenyl (114)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,4',6-Pentachlorobiphenyl (115)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,5,6-Pentachlorobiphenyl (116)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4',5,6-Pentachlorobiphenyl (117)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4',5-Pentachlorobiphenyl (118)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4',6-Pentachlorobiphenyl (119)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,5,5'-Pentachlorobiphenyl (120)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	Tissue
2,3',4,5,'6-Pentachlorobiphenyl (121)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,3',4,5-Pentachlorobiphenyl (122)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,4,4',5-Pentachlorobiphenyl (123)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,4,5,5'-Pentachlorobiphenyl (124)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2',3,4,5,6'-Pentachlorobiphenyl (125)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,4',5-Pentachlorobiphenyl (126)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,5,5'-Pentachlorobiphenyl (127)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4'-Hexachlorobiphenyl (128)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5-Hexachlorobiphenyl (129)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5'-Hexachlorobiphenyl (130)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,6-Hexachlorobiphenyl (131)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,6'-Hexachlorobiphenyl (132)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,5'-Hexachlorobiphenyl (133)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,6-Hexachlorobiphenyl (134)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,6'-Hexachlorobiphenyl (135)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',6,6'-Hexachlorobiphenyl (136)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5-Hexachlorobiphenyl (137)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5'-Hexachlorobiphenyl (138)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',6-Hexachlorobiphenyl (139)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',6'-Hexachlorobiphenyl (140)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,5'-Hexachlorobiphenyl (141)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,6-Hexachlorobiphenyl (142)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,6'-Hexachlorobiphenyl (143)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5',6-Hexachlorobiphenyl (144)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,6,6'-Hexachlorobiphenyl (145)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	Tissue
2,2',3,4',5,5'-Hexachlorobiphenyl (146)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,6-Hexachlorobiphenyl (147)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,6'-Hexachlorobiphenyl (148)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5',6-Hexachlorobiphenyl (149)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',6,6'-Hexachlorobiphenyl (150)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,5',6-Hexachlorobiphenyl (151)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,5,6,6'-Hexachlorobiphenyl (152)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4',5,5'-Hexachlorobiphenyl (153)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4',5',6-Hexachlorobiphenyl (154)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',4,4',6,6'-Hexachlorobiphenyl (155)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5-Hexachlorobiphenyl (156)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5'-Hexachlorobiphenyl (157)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',6-Hexachlorobiphenyl (158)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5,5'-Hexachlorobiphenyl (159)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5,6-Hexachlorobiphenyl (160)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5',6-Hexachlorobiphenyl (161)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',5,5'-Hexachlorobiphenyl (162)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',5,6-Hexachlorobiphenyl (163)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',5',6-Hexachlorobiphenyl (164)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',5,5',6-Hexachlorobiphenyl (165)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,4,4',5,6-Hexachlorobiphenyl (166)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4',5,5'-Hexachlorobiphenyl (167)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3',4,4',5',6-Hexachlorobiphenyl (168)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
3,3',4,4',5,5'-Hexachlorobiphenyl (169)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5-Heptachlorobiphenyl (170)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	Tissue
2,2'3,3',4,4',6-Heptachlorobiphenyl (171)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,5'-Heptachlorobiphenyl (172)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,6-Heptachlorobiphenyl (173)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,6'-Heptachlorobiphenyl (174)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5',6-Heptachlorobiphenyl (175)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,6,6'-Heptachlorobiphenyl (176)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4',5,6-Heptachlorobiphenyl (177)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,5',6-Heptachlorobiphenyl (178)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,6,6'-Heptachlorobiphenyl (179)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,5'-Heptachlorobiphenyl (180)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,6-Heptachlorobiphenyl (181)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,6'-Heptachlorobiphenyl (182)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5',6-Heptachlorobiphenyl (183)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',6,6'-Heptachlorobiphenyl (184)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,5',6-Heptachlorobiphenyl (185)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,5,6,6'-Heptachlorobiphenyl (186)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,5',6-Heptachlorobiphenyl (187)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4',5,6,6'-Heptachlorobiphenyl (188)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5,5'-Heptachlorobiphenyl (189)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5,6-Heptachlorobiphenyl (190)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5',6-Heptachlorobiphenyl (191)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,5,5',6-Heptachlorobiphenyl (192)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4',5,5',6-Heptachlorobiphenyl (193)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,5'-Octachlorobiphenyl (194)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,6-Octachlorobiphenyl (195)	-----------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	Tissue
2,2',3,3',4,4',5,6'-Octachlorobiphenyl (196)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',6,6'-Octachlorobiphenyl (197)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,5',6-Octachlorobiphenyl (198)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,5',6'-Octachlorobiphenyl (199)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,6,6'-Octachlorobiphenyl (200)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5',6,6'-Octachlorobiphenyl (201)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',5,5',6,6'-Octachlorobiphenyl (202)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,5',6-Octachlorobiphenyl (203)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,4,4',5,6,6'-Octachlorobiphenyl (204)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,3,3',4,4',5,5',6-Octachlorobiphenyl (205)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (206)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (207)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (208)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Decachlorobiphenyl (209)	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Monochlorobiphenyl, Total	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Dichlorobiphenyl, Total	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Trichlorobiphenyl, Total	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Tetrachlorobiphenyl, Total	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Pentachlorobiphenyl, Total	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Hexachlorobiphenyl, Total	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Heptachlorobiphenyl, Total	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Octachlorobiphenyl, Total	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Nonachlorobiphenyl, Total	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Decachlorobiphenyl, Total	------------------------	EPA 1668A/1668C	EPA 1668A/1668C	EPA 1668A/1668C
Per- and Poly-fluorinated compounds				
Perfluorobutanesulfonic acid (PFBS)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	Tissue
Perfluoroheptanonic acid (PFHpA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorohexanesulfononic acid (PFHxS)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorooctanesulfonic acid (PFOS)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorooctanoic acid (PFOA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorononaoic acid (PFNA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluoroheptanesulfonate (PFHpS)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorodecanesulfonate (PFDS)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluoropentanoic acid (PFPeA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluoroundecanoic acid (PFUdA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorodecanoic acid (PFDA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorododecanoic acid (PFDoA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorotridecanoic acid (PFTrDA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorotetradecanoic acid (PFTeDA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorohexadecanoic acid (PFHxDA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorobutanoic acid (PFBA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorohexanoic acid (PFHxA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
6:2 Fluorotelomer sulfanate (6:2 FTS)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
8:2 Fluorotelomer sulfanate (8:2 FTS)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
N-methylperfluoro-1-octanesulfonamide (N-MeFOSA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
N-ethylperfluoro-1-octanesulfonamide (N-EtFOSA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
Perfluorooctane sulfonamide (PFOSA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
N-methylperfluoro-1-octanesulfonamido ethanol (N-MeFOSE)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
N-ethylperfluoro-1-octanesulfonamido ethanol (N-EtFOSE)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	EPA 537 mod	EPA 537 mod	EPA 537 mod (VAL-PFAS)	EPA 537 mod (VAL-PFAS)

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste	Tissue
1,4-Dioxane				
1,4-Dioxane	---------------------	EPA 522 mod	------------------	------------------

Department of Energy
Washington, DC 20585

February 16, 2016

Mr. Robert L. Pullano
Quality Assurance Manager
GEL Laboratories, Inc.
2040 Savage Road
Charleston, South Carolina 29407

Dear Mr. Pullano:

UNITED STATES DEPARTMENT OF ENERGY CONSOLIDATED AUDIT PROGRAM — AUDIT NOTIFICATION — CONTINUING AUDIT OF GEL LABORATORIES, INC. — CHARLESTON, SOUTH CAROLINA — APRIL 5-7, 2016 — AUDIT ID: 160407-GEL

In accordance with our initial coordination with your facility, the United States (U.S.) Department of Energy Consolidated Audit Program (DOECAP) has scheduled a continuing audit of your facility on April 5-7, 2016.

The DOECAP audit team will be led by James Chambers and may include support of representatives from various U.S. Department of Energy (DOE) sites. The scope of the audit is a general review of compliance with the current version of the U.S. Department of Defense/DOE *Consolidated Quality Systems Manual (QSM) for Environmental Laboratories* and other applicable DOE contractual requirements. The following technical areas will be assessed during the audit:

1. Quality Assurance Management Systems and General Laboratory Practices
2. Data Quality for Organic Analyses
3. Data Quality for Inorganic and Wet Chemistry Analyses
4. Data Quality for Radiochemistry Analyses
5. Laboratory Information Management Systems/Electronic Data Management
6. Hazardous and Radioactive Materials Management

The audit team will conduct an opening meeting on Tuesday, April 5, 2016, to establish points of contact with your staff and discuss details regarding performance of the audit. An exit meeting will be held at the conclusion of the audit, tentatively scheduled for late afternoon on Thursday, April 7, 2016, at which time the audit team will present a draft audit report and address questions from you and/or your staff. Please plan to have the appropriate technical and management personnel available at afternoon debriefs.

UNITED STATES DEPARTMENT OF ENERGY CONSOLIDATED AUDIT PROGRAM — AUDIT NOTIFICATION — CONTINUING AUDIT OF GEL LABORATORIES, INC. — CHARLESTON, SOUTH CAROLINA — APRIL 5-7, 2016 — AUDIT ID: 160407-GEL

You will receive a pre-audit information request from the DOECAP Operations Team for documents that will be distributed to the audit team. In addition, an audit plan will be developed and transmitted to you electronically. We invite you to visit the non-password-protected portion of the web-based DOECAP Electronic Data System (http://www.p2s.com/?page_id=1526/) to view checklists and other items related to this audit which will be used by the DOECAP audit team.

If you have any questions or comments regarding this audit, please contact Joe Pardue at (865) 220-4352.

Sincerely,

George E. Detsis

George E. Detsis, Manager,
Analytical Services Program
U.S. Department of Energy
Office of Sustainable Environmental
Stewardship, AU-21

cc:
James Chambers, Fluor-BWXT Portsmouth, LLC

CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

CALIFORNIA STATE

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

CERTIFICATE OF ENVIRONMENTAL ACCREDITATION

Is hereby granted to

GEL Laboratories, LLC

2040 Savage Road

Charleston, SC 29417

Scope of the certificate is limited to the
"Fields of Testing"
which accompany this Certificate.

Continued accredited status depends on successful completion of on-site inspection, proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **2940**

Expiration Date: **11/30/2017**

Effective Date: **12/1/2015**

Sacramento, California
subject to forfeiture or revocation

Christine Sotelo, Chief
Environmental Laboratory Accreditation Program

CALIFORNIA Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

CALIFORNIA STATE
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
Accredited Fields of Testing

GEL Laboratories, LLC

2040 Savage Road
Charleston, SC 29417
Phone: (843) 556-8171

Certificate No. **2940**
Expiration Date 11/30/2017

Field of Testing: 106 - Radiochemistry of Drinking Water

106.010	001	Gross Alpha	EPA 900.0
106.010	002	Gross Beta	EPA 900.0
106.030	001	Radioactive Cesium	EPA 901.1
106.030	002	Radioactive Iodine	EPA 901.1
106.030	003	Gamma Emitters	EPA 901.1
106.040	001	Radioactive Iodine	EPA 902.0
106.050	001	Total Alpha Radium	EPA 903.0
106.050	002	Radium-226 (estimate)	EPA 903.0
106.051	001	Radium-226	EPA 903.1
106.060	001	Radium-228	EPA 904.0
106.070	001	Strontium-89, 90	EPA 905.0
106.070	002	Strontium-89	EPA 905.0
106.070	003	Strontium-90	EPA 905.0
106.080	001	Tritium	EPA 906.0
106.092	001	Uranium	EPA 200.8
106.120	001	Gross Alpha	EPA 00-02
106.230	001	Uranium	DOE U-02
106.250	002	Radioactive Iodine	DOE 4.5.2.3
106.250	003	Gamma Emitters	DOE 4.5.2.3
106.480	001	Uranium	ASTM D5174-97
106.610	001	Radon-222	SM7500-Rn

Field of Testing: 108 - Inorganic Chemistry of Wastewater

108.020	001	Conductivity	EPA 120.1
108.090	001	Residue, Volatile	EPA 160.4
108.110	001	Turbidity	EPA 180.1
108.112	001	Boron	EPA 200.7
108.112	002	Calcium	EPA 200.7
108.112	003	Hardness (calculation)	EPA 200.7
108.112	004	Magnesium	EPA 200.7
108.112	005	Potassium	EPA 200.7
108.112	006	Silica	EPA 200.7
108.112	007	Sodium	EPA 200.7
108.113	003	Magnesium	EPA 200.8
108.120	001	Bromide	EPA 300.0
108.120	002	Chloride	EPA 300.0
108.120	003	Fluoride	EPA 300.0
108.120	008	Sulfate	EPA 300.0
108.120	012	Nitrate (as N)	EPA 300.0

As of 12/1/2015 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

108.120	013	Nitrate-Nitrite (as N)	EPA 300.0
108.120	014	Nitrite as N	EPA 300.0
108.120	015	Phosphate, Ortho (as P)	EPA 300.0
108.183	001	Cyanide, Total	EPA 335.4
108.209	001	Ammonia (as N)	EPA 350.1
108.211	002	Kjeldahl Nitrogen, Total (as N)	EPA 351.2
108.232	003	Nitrate-Nitrite (as N)	EPA 353.2
108.266	001	Phosphorus, Total	EPA 365.4
108.323	001	Chemical Oxygen Demand	EPA 410.4
108.362	001	Phenols, Total	EPA 420.4
108.381	001	Oil and Grease	EPA 1664A
108.385	001	Color	SM2120B-2001
108.390	001	Turbidity	SM2130B-2001
108.400	001	Acidity	SM2310B
108.410	001	Alkalinity	SM2320B
108.420	001	Hardness (calculation)	SM2340B
108.421	001	Hardness	SM2340C
108.430	001	Conductivity	SM2510B-1997
108.439	001	Residue, Volatile	SM2540E-1997
108.440	001	Residue, Total	SM2540B
108.441	001	Residue, Filterable TDS	SM2540C
108.442	001	Residue, Non-filterable TSS	SM2540D
108.443	001	Residue, Settleable	SM2540F
108.465	001	Chlorine, Total	SM4500-Cl G-2000
108.470	001	Cyanide, Total	SM4500-CN C
108.472	001	Cyanide, Total	SM4500-CN C,E-1999
108.473	001	Cyanide, amenable	SM4500-CN G
108.490	001	Hydrogen Ion (pH)	SM4500-H+ B
108.500	002	Ammonia (as N)	SM4500-NH3 B,C-1997
108.508	001	Ammonia	SM4500-NH3 H
108.513	001	Kjeldahl Nitrogen, Total (as N)	SM4500-Norg D-1997
108.536	001	Oxygen, dissolved	SM4500-O G-2001
108.545	001	Phosphorus, Total	SM4500-P H-1999
108.560	001	Sulfite	SM4500-SO3 B
108.584	001	Sulfide (as S)	SM4500-S= D-2000
108.592	001	Biochemical Oxygen Demand	SM5210B-2001
108.592	002	Carbonaceous BOD	SM5210B-2001
108.595	001	Chemical Oxygen Demand	SM5220D-1997
108.596	001	Organic Carbon-Total (TOC)	SM5310B
108.605	001	Surfactants	SM5540C-2000

Field of Testing: 109 - Toxic Chemical Elements of Wastewater

109.010	001	Aluminum	EPA 200.7
109.010	002	Antimony	EPA 200.7
109.010	003	Arsenic	EPA 200.7
109.010	004	Barium	EPA 200.7
109.010	005	Beryllium	EPA 200.7
109.010	006	Boron	EPA 200.7

109.010	007	Cadmium	EPA 200.7
109.010	009	Chromium	EPA 200.7
109.010	010	Cobalt	EPA 200.7
109.010	011	Copper	EPA 200.7
109.010	012	Iron	EPA 200.7
109.010	013	Lead	EPA 200.7
109.010	015	Manganese	EPA 200.7
109.010	016	Molybdenum	EPA 200.7
109.010	017	Nickel	EPA 200.7
109.010	019	Selenium	EPA 200.7
109.010	021	Silver	EPA 200.7
109.010	023	Thallium	EPA 200.7
109.010	024	Tin	EPA 200.7
109.010	025	Titanium	EPA 200.7
109.010	026	Vanadium	EPA 200.7
109.010	027	Zinc	EPA 200.7
109.020	001	Aluminum	EPA 200.8
109.020	002	Antimony	EPA 200.8
109.020	003	Arsenic	EPA 200.8
109.020	004	Barium	EPA 200.8
109.020	005	Beryllium	EPA 200.8
109.020	006	Cadmium	EPA 200.8
109.020	007	Chromium	EPA 200.8
109.020	008	Cobalt	EPA 200.8
109.020	009	Copper	EPA 200.8
109.020	010	Lead	EPA 200.8
109.020	011	Manganese	EPA 200.8
109.020	012	Molybdenum	EPA 200.8
109.020	013	Nickel	EPA 200.8
109.020	014	Selenium	EPA 200.8
109.020	015	Silver	EPA 200.8
109.020	016	Thallium	EPA 200.8
109.020	018	Zinc	EPA 200.8
109.190	001	Mercury	EPA 245.1
109.191	001	Mercury	EPA 245.2
109.361	001	Mercury	EPA 1631E
109.445	002	Chromium (VI)	SM3500-Cr B-2009

Field of Testing: 110 - Volatile Organic Chemistry of Wastewater

110.040	000	Purgeable Organic Compounds	EPA 624

Field of Testing: 111 - Semi-volatile Organic Chemistry of Wastewater

111.100	000	Base/Neutral & Acid Organics	EPA 625
111.170	000	Pesticides & PCBs	EPA 608

Field of Testing: 112 - Radiochemistry of Wastewater

112.010	001	Gross Alpha	EPA 900.0
112.010	002	Gross Beta	EPA 900.0
112.021	001	Radium-226	EPA 903.1

112.140	001	Cesium	EPA 901.1
112.140	002	Gamma Emitters	EPA 901.1
112.160	001	Radium-228	EPA 904.0
112.170	001	Strontium	EPA 905.0
112.180	001	Tritium	EPA 906.0
112.490	001	Cesium	DOE 4.5.2.3
112.490	002	Gamma Emitters	DOE 4.5.2.3
112.500	001	Strontium	DOE Sr-01
112.510	001	Strontium	DOE Sr-02
112.520	001	Uranium	DOE U-02

Field of Testing: 114 - Inorganic Chemistry of Hazardous Waste

114.010	001	Antimony	EPA 6010B
114.010	002	Arsenic	EPA 6010B
114.010	003	Barium	EPA 6010B
114.010	004	Beryllium	EPA 6010B
114.010	005	Cadmium	EPA 6010B
114.010	006	Chromium	EPA 6010B
114.010	007	Cobalt	EPA 6010B
114.010	008	Copper	EPA 6010B
114.010	009	Lead	EPA 6010B
114.010	010	Molybdenum	EPA 6010B
114.010	011	Nickel	EPA 6010B
114.010	012	Selenium	EPA 6010B
114.010	013	Silver	EPA 6010B
114.010	014	Thallium	EPA 6010B
114.010	015	Vanadium	EPA 6010B
114.010	016	Zinc	EPA 6010B
114.020	001	Antimony	EPA 6020
114.020	002	Arsenic	EPA 6020
114.020	003	Barium	EPA 6020
114.020	004	Beryllium	EPA 6020
114.020	005	Cadmium	EPA 6020
114.020	006	Chromium	EPA 6020
114.020	007	Cobalt	EPA 6020
114.020	008	Copper	EPA 6020
114.020	009	Lead	EPA 6020
114.020	010	Molybdenum	EPA 6020
114.020	011	Nickel	EPA 6020
114.020	012	Selenium	EPA 6020
114.020	013	Silver	EPA 6020
114.020	014	Thallium	EPA 6020
114.020	016	Zinc	EPA 6020
114.103	001	Chromium (VI)	EPA 7196A
114.140	001	Mercury	EPA 7470A
114.141	001	Mercury	EPA 7471A
114.221	001	Cyanide, Total	EPA 9012B
114.230	001	Sulfides, Total	EPA 9034

114.240	001	Corrosivity - pH Determination	EPA 9040B
114.241	001	Corrosivity - pH Determination	EPA 9045C

Field of Testing: 115 - Extraction Test of Hazardous Waste

115.020	001	Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311
115.021	001	TCLP Inorganics	EPA 1311
115.022	001	TCLP Extractables	EPA 1311
115.023	001	TCLP Volatiles	EPA 1311
115.030	001	Waste Extraction Test (WET)	CCR Chapter11, Article 5, Appendix II
115.040	001	Synthetic Precipitation Leaching Procedure (SPLP)	EPA 1312

Field of Testing: 116 - Volatile Organic Chemistry of Hazardous Waste

116.010	000	EDB and DBCP	EPA 8011
116.020	031	Ethanol and Methanol	EPA 8015B
116.030	001	Gasoline-range Organics	EPA 8015B
116.080	000	Volatile Organic Compounds	EPA 8260B
116.080	120	Oxygenates	EPA 8260B
116.110	001	Total Petroleum Hydrocarbons - Gasoline	LUFT

Field of Testing: 117 - Semi-volatile Organic Chemistry of Hazardous Waste

117.010	001	Diesel-range Total Petroleum Hydrocarbons	EPA 8015B
117.016	001	Diesel-range Total Petroleum Hydrocarbons	LUFT
117.110	000	Extractable Organics	EPA 8270C
117.140	000	Polynuclear Aromatic Hydrocarbons	EPA 8310
117.170	000	Nitroaromatics and Nitramines	EPA 8330
117.171	000	Nitroaromatics and Nitramines	EPA 8330A
117.210	000	Organochlorine Pesticides	EPA 8081A
117.220	000	PCBs	EPA 8082
117.250	000	Chlorinated Herbicides	EPA 8151A

Field of Testing: 118 - Radiochemistry of Hazardous Waste

118.010	001	Gross Alpha	EPA 9310
118.010	002	Gross Beta	EPA 9310
118.020	001	Radium, Total	EPA 9315
118.030	001	Radium-228	EPA 9320
118.140	001	Radium-226	EPA Ra-04
118.270	001	Strontium	DOE Sr-01
118.271	001	Strontium	DOE Sr-02
118.290	001	Uranium	DOE U-02

Field of Testing: 120 - Physical Properties of Hazardous Waste

120.010	001	Ignitability	EPA 1010
120.020	001	Ignitability	EPA 1020A
120.030	001	Corrosivity	EPA 1110
120.040	001	Reactive Cyanide	Section 7.3 SW-846
120.050	001	Reactive Sulfide	Section 7.3 SW-846
120.070	001	Corrosivity - pH Determination	EPA 9040B
120.080	001	Corrosivity - pH Determination	EPA 9045C

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

GEL LABORATORIES, LLC
2040 Savage Road
Charleston, SC 29414
Robert L. Pullano Phone: (843) 556-8171
rlp@gel.com

ENVIRONMENTAL

Valid To: June 30, 2017 Certificate Number: 2567.01

In recognition of the successful completion of the A2LA evaluation process, including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2003 NELAC and the 2009 TNI Environmental Testing Laboratory Standard, and the requirements of the Department of Defense (DoD) and Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories as detailed in version 5.0, accreditation is granted to this laboratory to perform the following radiochemical tests in various matrices, including soils, drinking water, wastewater, groundwater, fiber air filters, vegetation, animal tissues and milk.

	Preparation SOP	**Analytical SOP**
Alpha Spectrometry: Alpha: Am-241, Am-243, Cf-252, Cm-242, Cm-243/244, Cm-245/246, Np-237, Po-208, Po-209, Po-210, Pu-236, Pu-238, Pu-239/240, Pu-241, Pu-242, Pu-244, Th-228, Th-229, Th-230, Th-232, U-232, U-233/234, U-235/236, U-238	GL-RAD-A-011, GL-RAD-A-016, GL-RAD-A-032, GL-RAD-A-035, GL-RAD-A-036, GL-RAD-A-038	GL-RAD-I-009
Radon Emanation: Ra-226	GL-RAD-A-008, GL-RAD-A-028	GL-RAD-I-007
Gamma Spectrometry: Gamma: 46 to 1836 keV, I-129, I-131, Ni-59	GL-RAD-A-006, GL-RAD-A-013, GL-RAD-A-022	GL-RAD-I-001
Kinetic Phosphorescence Analyzer: Total Uranium	GL-RAD-A-023	GL-RAD-B-018

	Preparation SOP	Analytical SOP
Gas Flow Proportional Counting: Alpha: Total Radium 48 Hour Gross Alpha Gross Alpha/Gross Beta Beta: Cl-36, I-131, Pb-210, Ra-228, Sr-89, Sr-90	 GL-RAD-A-010, GL-RAD-A-044 GL-RAD-A-047 GL-RAD-A-001, GL-RAD-A-001B, GL-RAD-A-001C, GL-RAD-A-001D GL-RAD-A-004, GL-RAD-A-009, GL-RAD-A-017, GL-RAD-A-018, GL-RAD-A-029, GL-RAD-A-030, GL-RAD-A-033, GL-RAD-A-054, GL-RAD-A-058	 GL-RAD-I-006, GL-RAD-I-015, GL-RAD-I-016
Liquid Scintillation Spectrometry: Gross Alpha/Gross Beta Alpha: Rn-222 Beta: C-14, Ca-45, Fe-55, H-3, Ni-63, P-32, Pm-147, Pu-241, S-35, Se-79, Tc-99	 GL-RAD-A-056 GL-RAD-A-007 GL-RAD-A-002, GL-RAD-A-003, GL-RAD-A-005, GL-RAD-A-019, GL-RAD-A-020, GL-RAD-A-022, GL-RAD-A-031, GL-RAD-A-035, GL-RAD-A-040, GL-RAD-A-048, GL-RAD-A-049, GL-RAD-A-050, GL-RAD-A-059	 GL-RAD-I-004, GL-RAD-I-014, GL-RAD-I-017
ICP-MS: Uranium Isotopes, Tc-99	 GL-RAD-A-005 GL-RAD-A-055	 GL-RAD-B-034

Additionally, in recognition of the successful completion of the A2LA evaluation process, including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2003 NELAC and 2009 TNI Standards, and the requirements of the Department of Defense (DoD) and Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for version 5.0 for Environmental Laboratories, accreditation is granted to this laboratory to perform recognized EPA, Standard Methods for the Examination of Water and Wastewater, ASTM, Department of Energy (DOE), California and Connecticut test methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies
Atomic Absorption/ICP-AES Spectrometry, ICP/MS, Gas Chromatography, Gas Chromatography/Mass Spectrometry, Gravimetry, High Performance Liquid Chromatography, Ion Chromatography, Methylene Blue Active Substances, Misc.- Electronic Probes (pH, O_2), Oxygen Demand, Hazardous Waste Characteristics Tests, Spectrophotometry (Visible), Spectrophotometry (Automated), IR Spectrometry, Titrimetry, Total Organic Carbon, Total Organic Halide, Turbidity, Liquid Chromatography/Mass Spectrometer/Mass Spectrometer and Various Radiochemistry Techniques

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste (Liquids and Solids)
Metals		
Aluminum	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Antimony	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C
Arsenic	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Barium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Beryllium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Bismuth	EPA 200.8, 6020/A	EPA 6020/A
Boron	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Cadmium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Calcium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Chromium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Cobalt	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Copper	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Hafnium	EPA 200.8, 6020/A	EPA 6020/A
Iron	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Lead	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Lithium	EPA 200.8, 6020/A	EPA 6020/A
Magnesium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Manganese	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Mercury	EPA 1631E, 7470/A, 245.1, 245.2	EPA 7470/A, 7471A/B
Molybdenum	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Nickel	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Phosphorous	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Potassium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Rhenium	EPA 200.8, 6020/A	EPA 6020/A
Rhodium	EPA 6020/6020A	EPA 6020/6020A
Selenium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Silicon[1]	EPA 200.7, 6010B/C modified	EPA 6010B/C modified
Silica as SiO2	EPA 200.7, 6010B/C	EPA 6010B/C
Silver	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C
Sodium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Strontium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Tantalum	EPA 200.8, 6020/A	EPA 6020/A
Thallium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Thorium	EPA 6020/A	EPA 6020/A
Tin	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C
Titanium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Tungsten	EPA 6020/A	EPA 6020/A
Uranium	ASTM D5174-02/97, DOE U-02, EPA 200.8, EPA 6020/A	DOE U-02, EPA 6020/A
Isotopic Uranium	EPA 6020/6020A	EPA 6020/6020A
Vanadium	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste (Liquids and Solids)
Zinc	EPA 200.7, 200.8, 6010B/C, 6020/A	EPA 6010B/C, 6020/A
Zirconium	EPA 6020/6020A	EPA 6020/6020A
General Chemistry		
Acidity	SM 2310 B, EPA 305.1	----------
Adsorbable Organic Halogens (AOX)	EPA 1650	----------
Alkalinity	SM 2320B, EPA 310.1	----------
Ammenable Cyanide	EPA 9012A/B, EPA 335.1, SM4500-CN^- G	EPA 9012A/B
Ammonia Nitrogen (and distillation)	EPA 350.1, SM4500NH_3 B/H	----------
Biochemical Oxygen Demand (BOD)	SM 5210 B	----------
Bromide	EPA 9056A, EPA 300.0	EPA 9056A[3]
Carbon Dioxide (Total and Free by calculation)	SM 4500CO_2 D	----------
Carbonaceous BOD (CBOD)	SM 5210 B	----------
Chemical Oxygen Demand (COD)	EPA 410.4, SM 5220 D	----------
Chloride	EPA 9056A, EPA 300.0	EPA 9056A[3]
Chlorine (residual)	SM 4500Cl-G, EPA 330.5	----------
Chromium VI	EPA 7196A, SM 3500Cr-B	EPA 7196A
Color	SM 2120B, EPA 110.2	----------
Corrosivity toward Steel	----------	EPA 1110/A
Cyanide	EPA 9012A/B, 335.3, 335.4, SM4500-CN^-E/G	EPA 9012A/B
Density	----------	ASTM D 5057
Extractable Organic Halides (EOX)	----------	EPA 9023
Fluoride	EPA 9056A, EPA 300.0	EPA 9056A[3]
Ignitability	EPA 1010, 1020A/B	EPA 1010, 1020A/B
Hardness (by calculation/titration)	SM 2340B/C, EPA 130.2 , EPA 200.7	----------
Kjeldahl Nitrogen (TKN)	EPA 351.2, SM 4500N_{org} D	----------
MBAS/Surfactants	SM 5540C, EPA 425.1	----------
Nitrate (as N)	EPA 9056A, EPA 300.0, SM4500-NO3-F	EPA 9056A[3]
Nitrate-nitrite (as N)	EPA 9056A, EPA 300.0	EPA 9056A[3]
Nitrite (as N)	EPA 9056A, EPA 300.0	EPA 9056A[3]
Odor	SM 2150B	----------
Oil & Grease	EPA 1664A	EPA 1664A
Organic Nitrogen	TKN – Ammonia, EPA 351.2 – EPA 350.1	----------
Orthophosphate (as P)	EPA 9056A, EPA 300.0	EPA 9056A[3]
Oxygen, Dissolved	SM 4500O G	----------
Paint Filter Liquids Test	----------	EPA 9095B
Perchlorate	EPA 314.0, 6850	EPA 6850
pH	SM 4500-H^+ B, EPA 9040B/C, 9041A, EPA 150.1	EPA 9040B/C, 9045C/D
Reactive Cyanide	Sec 7.3.3 SW846	Sec 7.3.3 SW846
Reactive Sulfide	Sec 7.3.4 SW846	Sec 7.3.4 SW846
Residue – Filterable (TDS)	SM 2540C, EPA 160.1	----------
Residue - Nonfilterable (TSS)	SM 2540D, EPA 160.2	----------
Residue - Settleable	SM 2540F	----------
Residue - Total	SM 2540B, EPA 160.3	----------
Residue - Total, fixed, and volatile	SM 2540G	----------
Residue - Volatile	SM 2540E, EPA 160.4	----------
Salinity	SM 2520B	----------
Specific conductance	EPA 9050A, EPA 120.1, SM 2510B	----------

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste (Liquids and Solids)
Sulfate	EPA 9056A, EPA 300.0	EPA 9056A[3]
Sulfite	SM 4500-SO_3^{2-} B	----------
Sulfide	EPA 9030B/9034, EPA 376.2, SM4500 S^{2-}D	EPA 9030B/9034
Total Nitrate-Nitrite	EPA 353.2, SM 4500NO_3^-F	----------
Total Organic Carbon (TOC)	EPA 9060/A, SM 5310B, 415.1	EPA 9060/A[2]
Total Organic Halides (TOX)	EPA 9020B	EPA 9020B[2]
Total Petroleum Hydrocarbons	EPA 1664A	EPA 1664A
Total Phenolics	EPA 9066, EPA 420.4	EPA 9066
Total Phosphorous	EPA 365.4, SM 4500P H	----------
Turbidity	EPA 180.1, SM 2130B	----------
Organic Analytes		
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1, 624, 8011, 8260B/C	EPA 8260B/C
1,2 Dibromoethane (EDB)	EPA 504.1, 624, 8011, 8260B/C	EPA 8260B/C
1,2,3-Trichloropropane	EPA 504.1, 624, 8011, 8260B/C	EPA 8260B/C
Purgeable Organics (Volatiles)		
1,1,1,2-Tetrachloroethane	EPA 624, 8260B/C	EPA 8260B/C
1,1,1-Trichloroethane	EPA 624, 8260B/C	EPA 8260B/C
1,1,2,2-Tetrachloroethane	EPA 624, 8260B/C	EPA 8260B/C
1,1,2-Trichloro-1,2,2-trifluoroethane	EPA 624, 8260B/C	EPA 8260B/C
1,1,2-Trichloroethane	EPA 624, 8260B/C	EPA 8260B/C
1,1-Dichloroethane	EPA 624, 8260B/C	EPA 8260B/C
1,1-Dichloroethene	EPA 624, 8260B/C	EPA 8260B/C
1,1-Dichloropropene	EPA 624, 8260B/C	EPA 8260B/C
1,2,3-Trichlorobenzene	EPA 624, 8260B/C	EPA 8260B/C
1,2,3-Trichloropropane	EPA 504.1, 624, 8011, 8260B/C	EPA 8260B/C
1,2,4-Trichlorobenzene	EPA 624, 8260B/C, 625, 8270C/D	EPA 8260B/C, 8270C/D
1,2,4-Trimethylbenzene	EPA 624, 8260B/C	EPA 8260B/C
1,2-Dichlorobenzene	EPA 624, 8260B/C, 625, 8270C/D	EPA 8260B/C, 8270C/D
1,2-Dichloroethane	EPA 624, 8260B/C	EPA 8260B/C
1,2-Dichloropropane	EPA 624, 8260B/C	EPA 8260B/C
1,3,5-Trimethylbenzene	EPA 624, 8260B/C	EPA 8260B/C
1,3-Dichlorobenzene	EPA 624, 8260B/C, 625, 8270C/D	EPA 8260B/C, 8270C/D
1,3-Dichloropropane	EPA 624, 8260B/C	EPA 8260B/C
1,4-Dichlorobenzene	EPA 624, 8260B/C, 625, 8270C/D	EPA 8260B/C, 8270C/D
1,4-Dioxane	EPA 624, 8260B/C, 625, 8270 C/D, 522	EPA 8260B/C, 8270 C/D
2,2-Dichloropropane	EPA 624, 8260B/C	EPA 8260B/C
2-Butanone (Methyl Ethyl Ketone)	EPA 8015 C/D, 624, 8260B/C	EPA 8015C/D, 8260B/C
2-Chloroethyl vinyl ether	EPA 624, 8260B/C	EPA 8260B/C
2-Chlorotoluene	EPA 624, 8260B/C	EPA 8260B/C
2-Hexanone	EPA 624, 8260B/C	EPA 8260B/C
2-Nitropropane	EPA 624, 8260B/C	EPA 8260B/C
2-Pentanone	EPA 624, 8260B/C	EPA 8260B/C
4-Chlorotoluene	EPA 624, 8260B/C	EPA 8260B/C
4-Isopropyltoluene	EPA 624, 8260B/C	EPA 8260B/C
4-Methyl-2-pentanone	EPA 624, 8260B/C	EPA 8260B/C
Acetone	EPA 624, 8260B/C	EPA 8260B/C
Acetonitrile	EPA 624, 8260B/C	EPA 8260B/C
Acrolein (Propenal)	EPA 624, 8260B/C	EPA 8260B/C
Acrylonitrile	EPA 624, 8260B/C	EPA 8260B/C
Allyl Chloride	EPA 624, 8260B/C	EPA 8260B/C

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste (Liquids and Solids)
Benzene	EPA 624, 8260B/C	EPA 8260B/C
Benzyl chloride	EPA 624, 8260B/C	EPA 8260B/C
Bromobenzene	EPA 624, 8260B/C	EPA 8260B/C
Bromochloromethane	EPA 624, 8260B/C	EPA 8260B/C
Bromodichloromethane	EPA 624, 8260B/C	EPA 8260B/C
Bromoform	EPA 624, 8260B/C	EPA 8260B/C
Bromomethane	EPA 624, 8260B/C	EPA 8260B/C
Carbon disulfide	EPA 624, 8260B/C	EPA 8260B/C
Carbon tetrachloride	EPA 624, 8260B/C	EPA 8260B/C
Chlorobenzene	EPA 624, 8260B/C	EPA 8260B/C
Chloroethane	EPA 624, 8260B/C	EPA 8260B/C
Chloroform	EPA 624, 8260B/C	EPA 8260B/C
Chloromethane	EPA 624, 8260B/C	EPA 8260B/C
Chloroprene	EPA 624, 8260B/C	EPA 8260B/C
cis-1,2-Dichloroethene	EPA 624, 8260B/C	EPA 8260B/C
cis-1,3-Dichloropropene	EPA 624, 8260B/C	EPA 8260B/C
cis-1,4-Dichloro-2-butene	EPA 624, 8260B/C	EPA 8260B/C
Cyclohexane	EPA 8260B/C	EPA 8260B/C
Cyclohexanone	EPA 8260B/C	EPA 8260B/C
Dibromochloromethane	EPA 624, 8260B/C	EPA 8260B/C
Dibromomethane	EPA 624, 8260B/C	EPA 8260B/C
Dichlorodifluoromethane	EPA 624, 8260B/C	EPA 8260B/C
Diethyl ether	EPA 624, 8260B/C	EPA 8260B/C
Ethyl Acetate	EPA 8015C/D, 624, 8260B/C	EPA 8015C/D, 8260B/C
Ethyl Benzene	EPA 624, 8260B/C	EPA 8260B/C
Ethyl methacrylate	EPA 624, 8260B/C	EPA 8260B/C
Hexachlorobutadiene	EPA 624, 8260B/C, 625, 8270C/D	EPA 8260B/C, 8270C/D
Iodomethane	EPA 624, 8260B/C	EPA 8260B/C
Isobutyl Alcohol	EPA 8015B/C, 624, 8260B/C	EPA 8260B/C
Isopropylbenzene	EPA 624, 8260B/C	EPA 8260B/C
Hexane	EPA 624, 8260B/C	EPA 8260B/C
m+p-Xylene	EPA 624, 8260B/C	EPA 8260B/C
Methacrylonitrile	EPA 624, 8260B/C	EPA 8260B/C
Methyl Acetate	EPA 8260B/C	EPA 8260B/C
Methyl methacrylate	EPA 624, 8260B/C	EPA 8260B/C
Methyl tert butyl ether (MTBE)	EPA 624, 8260B/C	EPA 8260B/C
Methylcyclohexane	EPA 8260B/C	EPA 8260B/C
Methylene chloride	EPA 624, 8260B/C	EPA 8260C
Naphthalene	EPA 624, 8260B/C, 625, 8270C/D[4], 8310	EPA 8260B/C, 8270C/D[4], 8310
n-Butyl alcohol	EPA 8015C/D, 624, 8260B/C	EPA 8015C/D, 8260B/C
n-Butylbenzene	EPA 624, 8260B/C	EPA 8260B/C
n-Propylbenzene	EPA 624, 8260B/C	EPA 8260B/C
o-Xylene	EPA 624, 8260B/C	EPA 8260B/C
Pentachloroethane	EPA 624, 8260B/C, 8270C/D	EPA 8260B/C, 8270C/D
Propionitrile	EPA 624, 8260B/C	EPA 8260B/C
Sec-Butylbenzene	EPA 624, 8260B/C	EPA 8260B/C
Styrene	EPA 624, 8260B/C	EPA 8260B/C
tert-Butyl Alcohol	EPA 8260B/C	EPA 8260B/C
tert-Butylbenzene	EPA 624, 8260B/C	EPA 8260B/C
Tetrachloroethene	EPA 624, 8260B/C	EPA 8260B/C

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste (Liquids and Solids)
Toluene	EPA 624, 8260B/C	EPA 8260B/C
trans-1,2-Dichloroethene	EPA 624, 8260B/C	EPA 8260B/C
trans-1,3-Dichloropropene	EPA 624, 8260B/C	EPA 8260B/C
trans-1,4-Dichloro-2-butene	EPA 624, 8260B/C	EPA 8260B/C
Trichloroethene	EPA 624, 8260B/C	EPA 8260B/C
Trichlorofluoromethane	EPA 624, 8260B/C	EPA 8260B/C
Trihalomethanes	EPA 624, 8260B/C	EPA 8260B/C
Vinyl acetate	EPA 624, 8260B/C	EPA 8260B/C
Vinyl chloride	EPA 624, 8260B/C	EPA 8260B/C
Xylenes, total	EPA 624, 8260B/C	EPA 8260B/C
Semivolatile Compounds		
1,2,4,5-Tetrachlorobenzene	EPA 625, 8270C/D	EPA 8270C/D
1,2,4-Trichlorobenzene	EPA 624, 8260B/C, 625, 8270C/D	EPA 8260B/C, 8270C/D
1,2-Dichlorobenzene	EPA 624, 8260B/C, 625, 8270C/D	EPA 8260B/C, 8270C/D
1,2-Diphenylhydrazine	EPA 625, 8270C/D	EPA 8270C/D
1,3,5-Trinitrobenzene	EPA 625, 8270C/D, 8330A/B[5]	EPA 8270C/D, 8330A/B[5]
1,3-Dichlorobenzene	EPA 624, 8260B/C, 625, 8270C/D	EPA 8260B/C, 8270C/D
1,3-Dinitrobenzene	EPA 625, 8270C/D, 8330A/B[5]	EPA 8270C/D, 8330A/B[5]
1,4-Dichlorobenzene	EPA 624, 8260B/C, 625, 8270C/D	EPA 8260B/C, 8270C/D
1,4-Dioxane	EPA 624, 8260B/C, 625, 8270C/D, 522	EPA 8260B/C, 8270C/D
1,4-Dinitrobenzene	EPA 625, 8270C/D	EPA 8270C/D
1,4-Naphthoquinone	EPA 625, 8270C/D	EPA 8270C/D
1,4-Phenylenediamine	EPA 625, 8270C/D	EPA 8270C/D
1-Methylnaphthalene	EPA 625, 8270C/D[4]	EPA 8270C/D[4]
1-Naphthylamine	EPA 625, 8270C/D	EPA 8270C/D
2,2-Dichlorobenzil	EPA 625, 8270C/D	EPA 8270C/D
2,3,4,6-Tetrachlorophenol	EPA 625, 8270C/D	EPA 8270C/D
2,3-Dichloroaniline	EPA 8270C/D	EPA 8270C/D
2,4,5-Trichlorophenol	EPA 625, 8270C/D	EPA 8270C/D
2,4,6-Trichlorophenol	EPA 625, 8270C/D	EPA 8270C/D
2,4-Dichlorophenol	EPA 625, 8270C/D	EPA 8270C/D
2,4-Dimethylphenol	EPA 625, 8270C/D	EPA 8270C/D
2,4-Dinitrophenol	EPA 625, 8270C/D	EPA 8270C/D
2,4-Dinitrotoluene	EPA 625, 8270C/D, 8330A/B[5]	EPA 8270C/D, 8330A/B[5]
2,6-Dichlorophenol	EPA 625, 8270C/D	EPA 8270C/D
2,6-Dinitrotoluene	EPA 625, 8270C/D, 8330A/B[5]	EPA 8270C/D, 8330A/B[5]
2-Acetylaminofluorene	EPA 625, 8270C/D	EPA 8270C/D
2-Chloronaphthalene	EPA 625, 8270C/D[4]	EPA 8270C/D[4]
2-Chlorophenol	EPA 625, 8270C/D	EPA 8270C/D
2-Methyl-4,6-Dinitrophenol	EPA 625, 8270C/D	EPA 8270C/D
2-Methylnaphthalene	EPA 625, 8270C/D	EPA 8270C/D
2-Methylphenol (o-cresol)	EPA 625, 8270C/D	EPA 8270C/D
2-Naphthylamine	EPA 625, 8270C/D	EPA 8270C/D
2-Nitroaniline	EPA 625, 8270C/D	EPA 8270C/D
2-Nitrophenol	EPA 625, 8270C/D	EPA 8270C/D
2-Picoline (2-Methylpyridine)	EPA 625, 8270C/D	EPA 8270C/D
3,3'-Dichlorobenzidine	EPA 625, 8270C/D	EPA 8270C/D
3,3'-Dimethylbenzidine	EPA 625, 8270C/D	EPA 8270C/D
3/4-Methylphenols(m/p cresols)	EPA 625, 8270C/D	EPA 8270C/D
3-Methylcholanthrene	EPA 625, 8270C/D	EPA 8270C/D
3-Nitroaniline	EPA 625, 8270C/D	EPA 8270C/D

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste (Liquids and Solids)
4,4-Dichlorodiphenyl sulfone	EPA 8270C/D	EPA 8270C/D
4,4-Dichlorophenyl disulfide	EPA 8270C/D	EPA 8270C/D
4-Aminobiphenyl	EPA 625, 8270C/D	EPA 8270C/D
4-Bromophenyl phenyl ether	EPA 625, 8270C/D	EPA 8270C/D
4-Chloro-3-methylphenol	EPA 625, 8270C/D	EPA 8270C/D
4-Chloroaniline	EPA 625, 8270C/D	EPA 8270C/D
4-Chlorophenyl phenyl ether	EPA 625, 8270C/D	EPA 8270C/D
4-Chlorothioanisole	EPA 8270C/D	EPA 8270C/D
4-Chlorothiophenol	EPA 8270C/D	EPA 8270C/D
4-Nitroaniline	EPA 625, 8270C/D	EPA 8270C/D
4-Nitrophenol	EPA 625, 8270C/D	EPA 8270C/D
5-Nitro-o-toluidine	EPA 625, 8270C/D	EPA 8270C/D
7,12-Dimethylbenz(a)anthracene	EPA 625, 8270C/D	EPA 8270C/D
Acenaphthene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Acenaphthylene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Acetophenone	EPA 625, 8270C/D	EPA 8270C/D
alpha-,alpha-Dimethylphenethylamine	EPA 625, 8270C/D	EPA 8270C/D
alpha-Terpineol	EPA 625, 8270C/D	EPA 8270C/D
Aniline	EPA 625, 8270C/D	EPA 8270C/D
Anthracene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Aramite	EPA 625, 8270C/D	EPA 8270C/D
Atrazine	EPA 625, 8270C/D	EPA 8270C/D
Benzaldehyde	EPA 8270C/D	EPA 8270C/D
Benzidine	EPA 625, 8270C/D	EPA 8270C/D
Benzo (a) anthracene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Benzo (a) pyrene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Benzo (b) fluoranthene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Benzo (ghi) perylene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Benzo (k) fluoranthene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Benzoic acid	EPA 625, 8270C/D	EPA 8270C/D
Benzothiazole	EPA 8270C/D	EPA 8270C/D
Benzyl alcohol	EPA 625, 8270C/D	EPA 8270C/D
Biphenyl	EPA 8270C/D	EPA 8270C/D
Bis (2-chloroethoxy) methane	EPA 625, 8270C/D	EPA 8270C/D
Bis (2-chloroethyl) ether	EPA 625, 8270C/D	EPA 8270C/D
Bis (2-chloro-1 methyl-ethyl) ether	EPA 625, 8270C/D	EPA 8270C/D
Bis (2-ethylhexyl) phthalate	EPA 625, 8270C/D	EPA 8270C/D
Bis(chloromethyl) ether	EPA 8270C/D	EPA 8270C/D
Bis(p-chlorophenyl) disulfide	EPA 8270C/D	EPA 8270C/D
Bis(p-chlorophenyl) sulfone	EPA 8270C/D	EPA 8270C/D
Butyl benzyl phthalate	EPA 625, 8270C/D	EPA 8270C/D
Caprolactam	EPA 8270C/D	EPA 8270C/D
Carbazole	EPA 625, 8270C/D	EPA 8270C/D
Chlorobenzilate	EPA 625, 8270C/D	EPA 8270C/D
Chrysene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Diallate	EPA 625, 8270C/D	EPA 8270C/D
Dibenzo (a,e) pyrene	EPA 625, 8270C/D	EPA 8270C/D
Dibenzo (a,h) anthracene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Dibenzofuran	EPA 625, 8270C/D	EPA 8270C/D
Diethyl phthalate	EPA 625, 8270C/D	EPA 8270C/D
Dimethoate	EPA 625, 8270C/D	EPA 8270C/D

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste (Liquids and Solids)
Dimethyl phthalate	EPA 625, 8270C/D	EPA 8270C/D
Di-n-butyl phthalate	EPA 625, 8270C/D	EPA 8270C/D
Di-n-octyl phthalate	EPA 625, 8270C/D	EPA 8270C/D
Diphenyl Disulfide	EPA 8270C/D	EPA 8270C/D
Diphenyl sulfide	EPA 8270C/D	EPA 8270C/D
Diphenyl sulfone	EPA 8270C/D	EPA 8270C/D
Diphenylamine	EPA 625, 8270C/D	EPA 8270C/D
Disulfoton	EPA 625, 8270C/D	EPA 8270C/D
Ethyl methacrylate	EPA 8270C/D	EPA 8270C/D
Ethyl methanesulfonate	EPA 625, 8270C/D	EPA 8270C/D
Famphur	EPA 625, 8270C/D	EPA 8270C/D
Fluoranthene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Fluorene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Hexachlorobenzene	EPA 625, 8270C/D	EPA 8270C/D
Hexachlorobutadiene	EPA 624, 8260B/C, 625, 8270C/D	EPA 8260B/C, 8270C/D
Hexachlorocyclopentadiene	EPA 625, 8270C/D	EPA 8270C/D
Hexachloroethane	EPA 625, 8270C/D	EPA 8270C/D
Hexachlorophene	EPA 625, 8270C/D	EPA 8270C/D
Hexachloropropene	EPA 625, 8270C/D	EPA 8270C/D
Indeno (1,2,3-cd) pyrene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Isodrin	EPA 625, 8270C/D	EPA 8270C/D
Isophorone	EPA 625, 8270C/D	EPA 8270C/D
Isosafrole	EPA 625, 8270C/D	EPA 8270C/D
Kepone	EPA 625, 8270C/D	EPA 8270C/D
Methapyrilene	EPA 625, 8270C/D	EPA 8270C/D
Methyl methacrylate	EPA 8270C/D	EPA 8270C/D
Methyl methanesulfonate	EPA 625, 8270C/D	EPA 8270C/D
Methyl parathion	EPA 625, 8270C/D	EPA 8270C/D
Naphthalene	EPA 624, 8260B/C, 625, 8270C/D[4], 8310	EPA8260B/C, 8270C/D[4], 8310
n-Decane	EPA 625, 8270C/D	EPA 8270C/D
Nitrobenzene	EPA 625, 8270C/D, 8330A/B[5]	EPA 8270C/D, 8330A/B[5]
Nitroquinoline-1-oxide	EPA 625, 8270C/D	EPA 8270C/D
N-Nitrosodietheylamine	EPA 625, 8270C/D	EPA 8270C/D
N-Nitrosodimethylamine	EPA 625, 8270C/D	EPA 8270C/D
N-Nitrosodimethylethylamine	EPA 625, 8270C/D	EPA 8270C/D
N-Nitrosodi-n-butylamine	EPA 625, 8270C/D	EPA 8270C/D
N-Nitrosodi-n-propylamine	EPA 625, 8270C/D	EPA 8270C/D
N-Nitrosodiphenylamine	EPA 625, 8270C/D	EPA 8270C/D
N-Nitrosomorpholine	EPA 625, 8270C/D	EPA 8270C/D
N-Nitrosopiperidine	EPA 625, 8270C/D	EPA 8270C/D
N-Nitrosopyrrolidine	EPA 625, 8270C/D	EPA 8270C/D
n-Octadecane	EPA 625, 8270C/D	EPA 8270C/D
o,o,o-Triethyl phosphorothioate	EPA 625, 8270C/D	EPA 8270C/D
Octachlorostyrene	EPA 8270C/D	EPA 8270C/D
o-Toluidine	EPA 625, 8270C/D	EPA 8270C/D
Parathion, ethyl	EPA 625, 8270C/D	EPA 8270C/D
p-Benzoquinone	EPA 625, 8270C/D	EPA 8270C/D
p-Dimethylaminoazobenzene	EPA 625, 8270C/D	EPA 8270C/D
Pentachlorobenzene	EPA 625, 8270C/D	EPA 8270C/D
Pentachloroethane	EPA 624, 8260B/C, 8270C/D	EPA 8260B/C, 8270C/D

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste (Liquids and Solids)
Pentachloronitrobenzene	EPA 625, 8270C/D	EPA 8270C/D
Pentachlorophenol	EPA 625, 8270C/D, 8151A	EPA 8270C/D, 8151A
Phenacetin	EPA 625, 8270C/D	EPA 8270C/D
Phenanthrene	EPA 625, 8270C/D[4], 8310	EPA 8270C/D[4], 8310
Phenol	EPA 625, 8270C/D	EPA 8270C/D
Phorate	EPA 625, 8270C/D	EPA 8270C/D
Pronamide (Kerb)	EPA 625, 8270C/D	EPA 8270C/D
Pyrene	EPA 625/8270C/D[4]/8310	EPA 8270C/D[4]/8310
Pyridine	EPA 625, 8270C/D	EPA 8270C/D
Safrole	EPA 625, 8270C/D	EPA 8270C/D
Sulfotepp	EPA 625, 8270C/D	EPA 8270C/D
Thionazin (Zinophos)	EPA 625, 8270C/D	EPA 8270C/D
Thiophenol (Benzenethiol)	EPA 8270C/D	EPA 8270C/D
Tributyl Phosphate	EPA 8270C/D	EPA 8270C/D
Pesticides & PCBs		
2,4'-DDD	EPA 8081A/B	EPA 8081A/B
2,4'-DDE	EPA 8081A/B	EPA 8081A/B
2,4'-DDT	EPA 8081A/B	EPA 8081A/B
4,4'-DDT	EPA 608, 8081A/B	EPA 8081A/B
4,4'-DDD	EPA 608, 8081A/B	EPA 8081A/B
4,4'-DDE	EPA 608, 8081A/B	EPA 8081A/B
Aldrin	EPA 608, 8081A/B	EPA 8081A/B
alpha-BHC	EPA 608, 8081A/B	EPA 8081A/B
alpha-Chlordane	EPA 608, 8081A/B	EPA 8081A/B
beta-BHC	EPA 608, 8081A/B	EPA 8081A/B
Chlordane (N.O.S)	EPA 608, 8081A/B	EPA 8081A/B
cis-Nonachlor	EPA 8081A/B	EPA 8081A/B
delta-BHC	EPA 608, 8081A/B	EPA 8081A/B
Dieldrin	EPA 608, 8081A/B	EPA 8081A/B
Endonsulfan sulfate	EPA 608, 8081A/B	EPA 8081A/B
Endosulfan I	EPA 608, 8081A/B	EPA 8081A/B
Endosulfan II	EPA 608, 8081A/B	EPA 8081A/B
Endrin	EPA 608, 8081A/B	EPA 8081A/B
Endrin aldehyde	EPA 608, 8081A/B	EPA 8081A/B
Endrin ketone	EPA 608, 8081A/B	EPA 8081A/B
gamma-BHC	EPA 608, 8081A/B	EPA 8081A/B
gamma-Chlordane	EPA 608, 8081A/B	EPA 8081A/B
Heptachlor	EPA 608, 8081A/B	EPA 8081A/B
Heptachlor epoxide	EPA 608, 8081A/B	EPA 8081A/B
Hexachlorobenzene	EPA 8081A/B	EPA 8081A/B
Methoxychlor	EPA 608, 8081A/B	EPA 8081A/B
Mirex	EPA 8081A/B	EPA 8081A/B
Oxychlordane	EPA 8081A/B	EPA 8081A/B
Toxaphene	EPA 608, 8081A/B	EPA 8081A/B
trans-Nonachlor	EPA 8081A/B	EPA 8081A/B
PCB-1016 (Aroclor)	EPA 608, 8082/A	EPA 8082/A
PCB-1221	EPA 608, 8082/A	EPA 8082/A
PCB-1232	EPA 608, 8082/A	EPA 8082/A
PCB-1242	EPA 608, 8082/A	EPA 8082/A
PCB-1248	EPA 608, 8082/A	EPA 8082/A
PCB-1254	EPA 608, 8082/A	EPA 8082/A

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste (Liquids and Solids)
PCB-1260	EPA 608, 8082/A	EPA 8082/A
PCB-1262	EPA 608, 8082/A	EPA 8082/A
PCB-1268	EPA 608, 8082/A	EPA 8082/A
Total Aroclors	EPA 608, 8082/A	EPA 8082/A
FID Compounds		
1,1,1-Trichloroethane	EPA 8015C/D	EPA 8015C/D
2-Butanone (Methyl Ethyl Ketone)	EPA 8015C/D, 624, 8260B/C	EPA 8015C/D, 8260B/C
4-Methyl-2-Pentanone	EPA 8015C/D	EPA 8015C/D
Acetone	EPA 8015C/D	EPA 8015C/D
Benzene	EPA 8015C/D	EPA 8015C/D
Chloroform	EPA 8015C/D	EPA 8015C/D
Diesel Range Organics (DRO)	EPA 8015C/D, CA-LUFT	EPA 8015C/D, CA-LUFT
Diethylene Glycol	EPA 8015C/D	EPA 8015C/D
Ethanol	EPA 8015C/D	EPA 8015C/D
Ethyl acetate	EPA 8015C/D, 624, 8260B/C	EPA 8015C/D, 8260B/C
Ethylbenzene	EPA 8015C/D	EPA 8015C/D
Ethylene Glycol	EPA 8015C/D	EPA 8015C/D
Gas Range Organics (GRO)	EPA 8015C/D, CA-LUFT	EPA 8015C/D, CA-LUFT
Kerosene	EPA 8015C/D	EPA 8015C/D
Isobutyl Alcohol	EPA 624, 8015C/D, 8260B/C	EPA 8015C/D, 8260B/C
Isopropyl Alcohol (2-Propanol)	EPA 8015C/D	EPA 8015C/D
m, p-Xylenes	EPA 8015C/D	EPA 8015C/D
Methanol	EPA 8015C/D	EPA 8015C/D
Methylene Chloride	EPA 8015C/D	EPA 8015C/D
n-Butyl alcohol	EPA 8015C/D, 624, 8260B/C	EPA 8015C/D, 8260B/C
o-Xylene	EPA 8015C/D	EPA 8015C/D
Propylene Glycol	EPA 8015C/D	EPA 8015C/D
Toluene	EPA 8015C/D	EPA 8015C/D
Triethylene Glycol	EPA 8015C/D	EPA 8015C/D
Volatile Petroleum Products	NWTPH-Gx(WDOE)	NWTPH-Gx(WDOE)
Semi-Volatile Petroleum Products	NWTPH-Dx(WDOE)	NWTPH-Dx(WDOE)
C8-C10 Aliphatic, Aromatic EPH	WDOE EPH	WDOE EPH
>C10-C12 Aliphatic, Aromatic EPH	WDOE EPH	WDOE EPH
>C12-C16 Aliphatic, Aromatic EPH	WDOE EPH	WDOE EPH
>C16-C21 Aliphatic, Aromatic EPH	WDOE EPH	WDOE EPH
>C21-C34 Aliphatic, Aromatic EPH	WDOE EPH	WDOE EPH
Alaska GRO	AK-101 (GRO)	AK-101 (GRO)
Alaska DRO	AK-102 (DRO)	AK-102 (DRO)
Alaska RRO	AK-103 (RRO)	AK-103 (RRO)
EPH Aliphatic and Aromatic ranges	MADEP EPH	MADEP EPH
VPH Aliphatic and Aromatic ranges	MADEP VPH	MADEP VPH
EPH Aliphatic C9 – C18	MADEP EPH	MADEP EPH
EPH Aliphatic C19 – C36	MADEP EPH	MADEP EPH
EPH Aromatic C11 - C22 Unadjusted	MADEP EPH	MADEP EPH
Nitrosamines, Nitroaromatics	**8330B is by LC/MS/MS. 8330A is by either LC/MS/MS or HPLC**	
1,3,5-Trinitrobenzene	EPA 625, 8270C/D, 8330A/B[5]	EPA 8270C/D, 8330A/B[5]
1,3-Dinitrobenzene	EPA 625, 8270C/D, 8330A/B[5]	EPA 8270C/D, 8330A/B[5]
2,4,6-Trinitrotoluene	EPA 8330A/B[5]	EPA 8330A/B[5]
2,4-Dinitrotoluene	EPA 625, 8270C/D, 8330A/B[5]	EPA 8270C/D, 8330A/B[5]
2,6-Dinitrotoluene	EPA 625, 8270C/D, 8330A/B[5]	EPA 8270C/D, 8330A/B[5]

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste (Liquids and Solids)
2-Amino-4,6-Dinitrotoluene	EPA 8330A/B[5]	EPA 8330A/B[5]
2-Nitrotoluene	EPA 8330A/B[5]	EPA 8330A/B[5]
Nitrosamines, Nitroaromatics	**8330B is by LC/MS/MS. 8330A is by either LC/MS/MS or HPLC**	
3,5-Dinitroaniline	EPA 8330B[5]	EPA 8330B[5]
3-Nitrotoluene	EPA 8330A/B[5]	EPA 8330A/B[5]
4-Amino-2,6-Dinitrotoluene	EPA 8330A/B[5]	EPA 8330A/B[5]
4-Nitrotoluene	EPA 8330A/B[5]	EPA 8330A/B[5]
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	EPA 8330A/B[5]	EPA 8330A/B[5]
Nitrobenzene	EPA 625, 8270C/D, 8330A/B[5]	EPA 8270C/D, 8330A/B[5]
Nitroglycerin	EPA 8330A/B[5]	EPA 8330A/B[5]
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330A/B[5]	EPA 8330A/B[5]
Pentaerythritoltetranitrate (PETN)	EPA 8330A/B[5]	EPA 8330A/B[5]
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330A/B[5]	EPA 8330A/B[5]
Dissolved Gases by FID		
Ethane	RSK 175	
Ethene	RSK 175	
Methane	RSK 175	
Herbicides		
2,4-D	EPA 8151A	EPA 8151A
2,4-DB	EPA 8151A	EPA 8151A
Dalapon	EPA 8151A	EPA 8151A
Dicamba	EPA 8151A	EPA 8151A
Dichloroprop	EPA 8151A	EPA 8151A
Dinoseb	EPA 8151A	EPA 8151A
MCPA	EPA 8151A	EPA 8151A
MCPP	EPA 8151A	EPA 8151A
2,4,5-T	EPA 8151A	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A	EPA 8151A
Pentachlorophenol	EPA 8151A	EPA 8151A
Radiochemistry		
Barium 133	DOE 4.5.2.3	DOE 4.5.2.3
Cesium 134	DOE 4.5.2.3, EPA 901.1	DOE 4.5.2.3
Cesium 137	DOE 4.5.2.3, EPA 901.1	DOE 4.5.2.3
Cobalt-60	DOE 4.5.2.3, EPA 901.1	DOE 4.5.2.3
Gamma Emitters	DOE 4.5.2.3, EPA 901.1	DOE 4.5.2.3
Gross Alpha	EPA 900.0, 9310	EPA 9310
Gross Beta	EPA 900.0, 9310	EPA 9310
Radioactive Iodine	DOE 4.5.2.3, EPA 901.1, 902.0	DOE 4.5.2.3
Radium-226	EPA 903.0, 903.1, DOE Ra-04	DOE Ra-04
Radium-228	EPA 904.0, 9320, DOE 4.5.2.3	DOE 4.5.2.3, EPA9320
Total Alpha Radium	EPA 903.0, 9315	EPA 9315
Radon-222	SM7500 Rn-B	----------
Strontium-89	EPA 905.0, DOE Sr-01	DOE Sr-01
Strontium-90	EPA 905.0, DOE Sr-02	DOE Sr-02
Thorium	EMSL-LV	EMSL-LV
Tritium	EPA 906.0	EPA 906.0 Modified
Uranium	ASTM D5174-02/97, DOE U-02, EPA 200.8, EPA 6020/A	DOE U-02, EPA 6020/A

Parameter/Analyte	Nonpotable Water	Solid Hazardous Waste (Liquids and Solids)
Zinc-65	EPA 901.1/DOE 4.5.2.3	DOE 4.5.2.3
Preparatory and Clean-up Methods		
Toxicity Characteristic Leaching Procedure (Inorganics, Extractable Organics, Volatile Organics)	----------	EPA 1311
Synthetic Precipitation Leaching Procedure	----------	EPA 1312
Waste Extraction Test (W.E.T.)	----------	CCR Chapter 11, Article 5, Appendix II
Anion Preparation	----------	EPA 9056A[3]
Cyanide Distillation	EPA 9010B/C, SM 4500CN^- C	EPA 9010B/C[3]
Sulfide Distillation	EPA 9030B	EPA 9030B
Metals Digestion	EPA 200.2, 3005A, 3010A	EPA 3050B
Alkaline Digestion for Hex Chromium	----------	EPA 3060A
Bomb Preparation for Solid Waste	----------	EPA 5050
Mercury Preparation	EPA 245.1, 245.2, 7470/A	EPA 7471A/B
Separatory Funnel Liquid-Liquid Extraction	EPA 3510C	----------
Continuous Liquid-Liquid Extraction	EPA 3520C	----------
Solid Phase Extraction	EPA 3535A	----------
Automated Soxhlet Extraction	----------	EPA 3541
Ultrasonic Extraction	----------	EPA 3550C
Waste Dilution	----------	EPA 3580A
Waste Dilution for Volatile Organics	----------	EPA 3585
Purge and Trap for Volatile Organics	EPA 5030A/B/C	EPA 5035/A/H/L
Alumina Clean-up	----------	EPA 3610B, 3611B
Florisil Clean-up	----------	EPA 3620B/C
Silica Gel Clean-up	----------	EPA 3630C
Gel Permeation Clean-up	----------	EPA 3640A
Sulfur Clean-up	----------	EPA 3660B
Sulfuric Acid/Permanganate Clean-up	----------	EPA 3665A

Metals on Filters	Air Filters
Aluminum	NIOSH 7303/EPA 6010B/C
Antimony	NIOSH 7303/EPA 6010B/C
Arsenic	NIOSH 7303/EPA 6010B/C
Barium	NIOSH 7303/EPA 6010B/C
Beryllium	NIOSH 7303/EPA 6010B/C
Cadmium	NIOSH 7303/EPA 6010B/C
Calcium	NIOSH 7303/EPA 6010B/C
Chromium	NIOSH 7303/EPA 6010B/C
Cobalt	NIOSH 7303/EPA 6010B/C
Copper	NIOSH 7303/EPA 6010B/C
Iron	NIOSH 7303/EPA 6010B/C
Lead	NIOSH 7303/EPA 6010B/C
Magnesium	NIOSH 7303/EPA 6010B/C
Manganese	NIOSH 7303/EPA 6010B/C
Molybdenum	NIOSH 7303/EPA 6010B/C
Nickel	NIOSH 7303/EPA 6010B/C
Phosphorous	NIOSH 7303/EPA 6010B/C
Potassium	NIOSH 7303/EPA 6010B/C
Selenium	NIOSH 7303/EPA 6010B/C
Silver	NIOSH 7303/EPA 6010B/C

Metals on Filters	**Air Filters**
Sodium	NIOSH 7303/EPA 6010B/C
Strontium	NIOSH 7303/EPA 6010B/C
Sulfur	NIOSH 7303/EPA 6010B/C
Tin	NIOSH 7303/EPA 6010B/C
Titanium	NIOSH 7303/EPA 6010B/C
Uranium	NIOSH 7303/EPA 6010B/C
Vanadium	NIOSH 7303/EPA 6010B/C
Zinc	NIOSH 7303/EPA 6010B/C
Drinking Water Organics	**Drinking Water**
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1
1,2 Dibromoethane (EDB)	EPA 504.1
1,2,3-Trichloropropane	EPA 504.1
1,4-Dioxane	EPA 522
1,1,1,2-Tetrachloroethane	EPA 524.2
1,1,1-Trichloroethane	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2
1,1-Dichloropropene	EPA 524.2
1,2,3-Trichlorobenzene	EPA 524.2
1,2,3-Trichloropropane	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2
1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,3-Dichloropropane	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2
2,2-Dichloropropane	EPA 524.2
2-Butanone (Methyl Ethyl Ketone)	EPA 524.2
2-Chlorotoluene	EPA 524.2
2-Hexanone	EPA 524.2
4-Chlorotoluene	EPA 524.2
4-Isopropyltoluene	EPA 524.2
4-Methyl-2-pentanone	EPA 524.2
Acetone	EPA 524.2
Benzene	EPA 524.2
Bromobenzene	EPA 524.2
Bromochloromethane	EPA 524.2
Bromodichloromethane	EPA 524.2
Bromoform	EPA 524.2
Bromomethane	EPA 524.2
Carbon disulfide	EPA 524.2
Carbon tetrachloride	EPA 524.2
Chlorobenzene	EPA 524.2
Chloroethane	EPA 524.2
Chloroform	EPA 524.2
Chloromethane	EPA 524.2
cis-1,2-Dichloroethene	EPA 524.2

Drinking Water Organics	**Drinking Water**
cis-1,3-Dichloropropene	EPA 524.2
Dibromochloromethane	EPA 524.2
Dibromomethane	EPA 524.2
Dichlorodifluoromethane	EPA 524.2
Ethyl Benzene	EPA 524.2
Hexachlorobutadiene	EPA 524.2
Iodomethane	EPA 524.2
Isopropylbenzene	EPA 524.2
Methyl tert butyl ether (MTBE)	EPA 524.2
Methylene chloride	EPA 524.2
m+p-Xylene	EPA 524.2
Naphthalene	EPA 524.2
n-Butylbenzene	EPA 524.2
n-Propylbenzene	EPA 524.2
o-Xylene	EPA 524.2
Sec-Butylbenzene	EPA 524.2
Styrene	EPA 524.2
Tert-Butylbenzene	EPA 524.2
Tetrachloroethene	EPA 524.2
Toluene	EPA 524.2
trans-1,2-Dichloroethene	EPA 524.2
trans-1,3-Dichloropropene	EPA 524.2
Trichloroethene	EPA 524.2
Trichlorofluoromethane	EPA 524.2
Trihalomethanes	EPA 524.2
Vinyl chloride	EPA 524.2
Xylenes, total	EPA 524.2

1 - Calculated from silica determination

2 – Applicable only to liquid ‘Solid Hazardous Waste’, where liquids may include aqueous, non-aqueous, and oily wastes. Solids may include soils, sediments, sludges, tissues, filters and any matrix deemed non-liquid.

3 – The referenced method is modified to include a simple prep for non-aqueous and/or solid matrix samples.

4 – The analytes may be determined by Selective Ion Monitoring (SIM) using either 8270C or 8270D.

5 – 8330B analysis is performed on LC/MS/MS. 8330A may be performed on either LC/MS/MS or HPLC.

Accreditation is also granted to this laboratory to perform the following tests on children’s toys:

Chemical	
Lead in Paint by ICP	16 CFR part 1303 (using GL-MA-E-009 and GL-MA-E-013)

Additionally, in recognition of the successful completion of the A2LA evaluation process (including an assessment of the laboratory's compliance with the 2009 TNI Standard Requirements), accreditation is granted to this laboratory to perform the following bioassay analyses on bone, tissue, urine, fecal, and nasal swabs.

	Preparation SOP	**Analytical SOP**
Bioassay Analysis		
Alpha Spectrometry: Alpha: Am-241, Cm-242, Cm-243/244, Cm 245/246, Cf-252, Np-237, Po-208, Po-209, Po-210, Pu-236, Pu-238, Pu-239/240, Pu-242, Pu-244, Th-228, Th-229, Th-230, Th-232, U-232, U-233/234, U-235/236, U-238	GL-RAD-B-001, GL-RAD-B-002, GL-RAD-B-003, GL-RAD-B-010, GL-RAD-B-012, GL-RAD-B-013, GL-RAD-B-017	GL-RAD-B-009
Liquid Scintillation Spectrometry: C-14, Fe-55, Gross Alpha, H-3, Ni-63, Pu-241, Tc-99	GL-RAD-B-001, GL-RAD-B-008, GL-RAD-B-011, GL-RAD-B-012, GL-RAD-B-013, GL-RAD-B-016, GL-RAD-B-020, GL-RAD-B-023	GL-RAD-I-004, GL-RAD-I-014, GL-RAD-I-017
Gas Flow Proportional Counting: Beta: Sr-90	GL-RAD-B-001	GL-RAD-I-006, GL-RAD-I-015, GL-RAD-I-016
Gross Alpha/Gross Beta	GL-RAD-B-022	GL-RAD-I-006
Kinetic Phosphorescence Analyzer: Total Uranium	GL-RAD-B-019	GL-RAD-B-018
Radon Emanation: Ra-226	GL-RAD-B-002	GL-RAD-I-007
Refractometer: Specific Gravity	GL-RAD-B-027	GL-RAD-B-027
ICP-MS: Uranium Isotopes	GL-RAD-B-035	GL-RAD-B-034
Gamma Spectrometry: Gamma: Ni-59, 46 to 1836 keV	GL-RAD-B-020, GL-RAD-A-013	GL-RAD-I-001

Accredited Laboratory

A2LA has accredited

GEL LABORATORIES, LLC

Charleston, SC

for technical competence in the field of

Environmental Testing

In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2005, the 2009 TNI Environmental Testing Laboratory Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.0 of the DoD Quality System Manual for Environmental Laboratories (QSM), accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION
CORPORATE SEAL 1978
DISTRICT OF COLUMBIA
A2LA

Presented this 7th day of July 2015.

President & CEO
For the Accreditation Council
Certificate Number 2567.01
Valid to June 30, 2017

For the tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

Appendix I. Specifications for Transmitting Analytical and QA/QC Data from a Subcontract Analytical Laboratory to Environment, Health and Safety Division, LBNL, April 26, 2012

Specifications for Transmitting Analytical and QA/QC Data
from a Subcontract Analytical Laboratory
to
Environment, Health and Safety Division,
Lawrence Berkeley National Laboratory

April 26, 2012

Direct Questions to:

Robert Fox
Environment, Health and Safety Division, LBNL
or
Steven J. Wyrick
IT Business Systems, LBNL

Contents

General Specifications

1. There are two required files to be transferred for each analytical transmission batch, the sample file and the analysis file. The sample file contains information about the sample taken at the sampling location. The analysis file contains information about the analyses performed on the samples.
2. There are two required files to be transferred for each QA/QC transmission batch, the QA/QC file and the batch number reference file. The first file contains information about the QA/QC samples and their analytes. The second file lists each QC batch number in the first file and each corresponding laboratory log number for all samples supported by that batch.
3. Include only data records in the above four files. Extraneous text or blank lines are erroneously interpreted as values of fields.
4. There is also a fifth text file to be transferred which shall contain additional information relevant to the analyses, that is not included in the above four files. Report case narrative or other qualifying information here. Information that links information in this file to the results to which they apply shall be included. Field Specifications. There are three types of field: character, numeric, and date. The asterisk (*), question mark (?), comma (,), percent sign (%), underscore (_), backslash (\), pound sign (#), single quote ('), double quote ("), and vertical bar (|) may NOT be used in ANY fields. Field contents may be variable length, and shall be less than or equal to the maximum length specified. Leading or trailing spaces should NOT be present (do not fill a field to the maximum length specified).

   Character fields are alphanumeric with restrictions described above. Character data may NOT be within quotes.

   Numeric fields may contain only the digits 0 through 9, “-”, ”.”, or “+”, and “e” or “E” when using scientific notation. Specific examples of data that is not acceptable in numeric fields include “NA”, “NR”, and “Not Reportable”, or any use of inequality signs (“<”, “>”).

   Date fields should be in one of these three formats:
   mm/dd/yyyy (11/15/1988)
   dd-mmm-yyyy (15-nov-1988)
   mm-dd-yyyy (11-15-1988)
5. Field Delimiter. The vertical bar, “|”, ASCII decimal code 124, shall be used to separate fields.
6. Record Delimiter. A carriage return with line feed shall separate each record.
7. A field delimiter shall follow every field except for the last field. A field delimiter may NOT follow the last field of a record.
8. If there is no data for a field, nothing should be put in the field; the delimiter indicating the end of the field should immediately follow the delimiter that indicates the end of the previous field. If the last field has no data, do not add a following field delimiter (the delimiter following the previous field becomes the last character of the record). Leave a field blank if the presumed concentration is zero (0), for example the before concentration of a blank spike is presumed zero since it is a known blank. Reporting a zero implies that an analysis was run by the reporting laboratory yielding zero.
9. Character Types. In addition to the restrictions given in #5 above, field contents shall use only characters within the range of ASCII decimal codes 32 through 126.
10. For questions, contact the Data Manager in the specific group with which you are working.

Field	Maximum Length	Description/Domain
log number	12	Analytical lab's unique log number used as the identifier of a sample taken by LBNL When reported: Shall be present and unique within a series approved by LBNL. Format: A unique pair of alpha characters which the lab shall add to the front of the log number will be assigned to the lab by LBNL ensuring that the log number is unique within LBNL's system.
sampling location	30	Unique identifier of a sampling location at LBNL When reported: Shall be present and identical as supplied by LBNL. Format: Any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), backslash (\), pound sign (#), single quote ('), double quote ("), and vertical bar (|).
requester	20	LBNL employee requesting the analysis When reported: Shall be present and identical as supplied by LBNL. Format: Any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), backslash (\), pound sign (#), single quote ('), double quote ("), and vertical bar (|).
depth of sample	6	Depth (in feet) of the sampling site from the surface When reported: Shall be present if supplied by LBNL Format: Identical as supplied by LBNL; range 0 - 9999.9.
date sampled	11	Date sample was collected from the sampling location When reported: Shall be present and identical as supplied by LBNL. Format: Not case-sensitive and shall be in one of these three formats: mm/dd/yyyy (11/15/1988) dd-mmm-yyyy (15-nov-1988) mm-dd-yyyy (11-15-1988)
note	100	Any notes When reported: Optional. Format: Any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), backslash (\), pound sign (#), single quote ('), double quote ("), and vertical bar (|).
lab	10	Identifier of the analytical lab When reported: Shall be present. Format: As assigned to the analytical lab by LBNL
document control number	10	LBNL's control number used to track miscellaneous sampling information When reported: If supplied by LBNL Format: identical as supplied by LBNL.
sample matrix	2	The medium of the sample. When reported: Shall be present Format: identical as supplied by LBNL when supplied or as provided and mutually accepted by the lab and LBNL. See Appendix B for allowable values.

Field	Maximum Length	Description/Domain
log number	12	Analytical lab’s unique log number used as the identifier of a sample taken by LBNL When reported: Shall be present. Format: Shall match a log number in the sample file, and shall be unique within a series approved by LBNL. A unique pair of alpha characters which the lab shall add to the front of the log number will be assigned to the lab by LBNL ensuring that the log number is unique within LBNL’s system.
parameter code	11	Code (assigned by LBNL) representing the analyte for which the sample is being analyzed When reported: Shall be present as supplied by LBNL. Contact the appropriate Data Manager for a new code if none exists. Format: See Appendix A for a list of acceptable values. No other values are allowed in this field.
reporting limit flag	1	Used to indicate a non-detect or when an analysis result is detected but is less than the contract reporting limit of the analysis When reported: Shall be present if the result is less than the contract reporting limit; otherwise optional if appropriate for the analysis. (See Appendix C – *Reporting convention description* for a more detailed explanation.) Format: “<” if result is less than the contract reporting limit. Empty if the result for the analysis is greater than or equal to the value of the associated contract reporting limit, unless appropriate for the analysis, e.g. ignitability, which can be “>” but not “=”.
analysis result	12	Result of the analysis. If the concentration or activity is at or greater than the contract reporting limit (CRL), the concentration or activity should be placed in the result field. If the concentration or activity is less than the CRL, the CRL should be placed in the result field and in this case the reporting limit flag should be set to “<”. (See Appendix C – *Reporting convention description* for a more detailed explanation.) If the analyte type is a surrogate, report the percentage of surrogate recovered calculated by the following formula, $$\frac{(\text{surrogate concentration})*100}{\text{Spike amount}}$$ When reported: Shall be present unless the result is non-numeric. Format: Numeric, in either standard or scientific notation. The number may not contain commas or alpha characters and should only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. If result is not numeric, leave this field blank and report the result in “comments” field as “Non-numeric result is:”.

contract reporting limit (CRL, also CRDL and RL) — 12

The required contract reporting limit as defined by the Contract Analytical Spreadsheet for the analysis being performed. The value reported in the CRL field must be adjusted to reflect sample dilution if the dilution causes the actual detection limit to exceed the required contract reporting limit. When the measured concentration is less than the contract reporting limit (adjusted for dilution) place the contract reporting limit in the “analysis result” field also, and place a “<” in the “reporting limit flag” field. The analytical method should be able to reliably detect the presence of the analyte in the sample when the analyte is actually present in the sample at a concentration at or above the CRL. When reporting a “contract required detection limit” as defined by the QSAS (page 9) use this field. If the analyte type is a surrogate, then report the surrogate lower control limit in this field.
When reported: Shall be present.
Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field.

units of result — 10

The units in which the analysis result is represented
When reported: Shall be present.
Format: Any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), vertical bar (|), backslash (\), pound sign (#), single quote (‘), and double quote (“).

requested analysis — 20

Code representing the analysis requested on the chain of custody (COC).
When reported: Shall be present
Format: Identical as supplied by LBNL. For valid value list see Contract Analytical Spreadsheet.

analysis method — 20

The EPA method or equivalent details of the method of analysis
When reported: Shall be present
Format: Any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), vertical bar (|), backslash (\), pound sign (#), single quote (‘), and double quote (“).

date extracted — 11

Date analyte was extracted
When reported: Shall be present if applicable
Format: Not case-sensitive and shall be in one of these three formats:
mm/dd/yyyy (11/15/1988)
dd-mmm-yyyy (15-nov-1988)
mm-dd-yyyy (11-15-1988)

date/time analyzed — 19

Date analysis took place.
When reported: Shall be present.
Format: Is not case-sensitive and the following format is preferred:
mm/dd/yyyy hh24:mi:ss, where
mm = month 01-12
dd = day 1-31
yyyy = year
hh24 = hour specified as 01-24
mi = minutes 01-59
ss = seconds
Report 0s for hours, minutes, seconds if not applicable. Other formats may be acceptable if agreed to by LBNL.

error in result	10	The error will contain the two sigma total propagated uncertainty associated with the measured value. <u>When reported:</u> Shall be present for radiological data. Present if applicable for other data. <u>Format:</u> Either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125.
instrument ID	6	Identifying code of the instrument used for analysis <u>When reported:</u> Shall be present. <u>Format:</u> Any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), backslash (\), pound sign (#), single quote (‘), double quote (“), and vertical bar (|).
analyst ID	4	Identifying code of the analyst at the analytical lab <u>When reported:</u> Shall be present. <u>Format:</u> Any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), backslash (\), pound sign (#), single quote (‘), double quote (“), and vertical bar (|).
dilution factor	7	Dilution factor used when performing the analysis. If no dilution is performed, specify a dilution factor equal to 1. <u>When reported:</u> Shall be present. <u>Format:</u> Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 2 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125.
extraction method	20	The identification of the method used to extract the compound for analysis <u>When reported:</u> Shall be present if applicable. <u>Format:</u> Identical as supplied by LBNL, if supplied. Any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), backslash (\), pound sign (#), single quote (‘), double quote (“), and vertical bar (|).
measured concentration or activity	12	The analyzed concentration for chemical analysis or activity for radiological analysis detected and corrected for technical factors, e.g. dilution. Activity shall be reported for radiological analysis. If a measured concentration or activity is below the CRL and reported on hardcopy, it shall be reported in this field. It shall be the same as analysis result when above the CRL. If the analyte type is a surrogate, then report the surrogate upper control limit in this field. (See Appendix C – *Reporting convention description* for a more detailed explanation.) <u>When reported:</u> Shall be present for radiological analyses. Shall be present for chemical analyses if the measured concentration is above the CRL; also shall be present if the measured concentration is between the Critical Level (MDL) and the CRL AND is reported on the hard copy; otherwise blank. <u>Format:</u> Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field.

critical level (CL, also MDL, L_C)	12	Use this field when reporting a method detection limit (MDL) as defined by the US EPA (40 CFR 136 Appendix B). Leave this field blank when reporting results for radiological analyses, unless reporting for a special project that requires reporting of the radiological decision level concentration (L_C; see the QSAS page 9 and "Additional Reporting Requirements" in the "Analytical Data Deliverables" section of the Statement of Work). The critical level is the lowest measured concentration above which one can confidently assert that the analyte has been detected. It is the lowest measurement that is unlikely to have been obtained from a blank sample. Any measurement above L_C should be considered strong evidence that the analyte is present in the sample. L_C is chosen so that the false detection probability is small. When reported: Shall be present for chemical analyses, blank unless specifically requested for radiological analyses. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125.Units: as reported in the "units of result" field.
detectable level (DL, also MDC, L_D)	12	Use this field when reporting a "minimum detectable concentration" as defined by the QSAS pages 14, D-37 through D-41. Use one of formulas on pages D-37 through D-41 of the QSAS, as appropriate, unless prior approval for a project-specific exception has been obtained. Leave this field blank when reporting results for analytical methods that do not have an MDC associated with them. The detectable level is the lowest concentration at or above which an analyte can confidently be detected (i.e., distinguished from zero). That is, when the true concentration is at or above DL, the measured concentration is highly likely to exceed the CL. Failures to detect the analyte should be rare when the true concentration is at or above the DL. When reported: Shall be present for radiological analyses, blank unless specifically requested for chemical analyses. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the "units of result" field.
quantitation limit (QL, also PQL, MQL)	12	Use when reporting a "practical quantitation limit" (as defined by the QSAS page 12), or "method quantitation limit" (as defined by SW-846, Method 8000B, sec. 7.4.1.2). The QL should reflect all applicable technical factors affecting its value (for example, dilution). Leave this field blank when reporting results for analytical methods that do not have a QL associated with them. When reported: Shall be present when requested. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the "units of result" field.
filtered	1	If the analyte being reported is filtered, place an "L" in this field for lab filtered. If the COC indicates that a sample was field filtered, place an "F" in this field. Otherwise place an "N" for not filtered.

When reported: Shall be present
Format: Shall be one of the following values: L, F, or N.

analyte description	50	Name of the analyte or property being reported. If the analyte description associated with the parameter code is inadequate to fully describe the analyte, e.g., total or filtered metals in water, free-water or organically-bound tritium in vegetation, include that information in the description. When reported: Must be present. Format: Any characters excluding asterisk (*), question mark (?), percent (%), underscore (_), vertical bar (|), backslash (\\), single quote (‘), double quote (“), and pound sign (#). NOTE: Commas are allowed only for chemical names.
comments	100	Any comments including extremely long names for tentatively identified compounds (TICs), retention time for TICs, CAS numbers for TICs, and non-numeric results noted with “Non-numeric result is:”. When reported: Optional. Format: Any characters excluding asterisk (*), question mark (?), percent (%), underscore (_), vertical bar (|), backslash (\\), single quote (‘), double quote (“), and pound sign (#). NOTE: Commas are allowed only for chemical names.
analyte type	3	Must be filled in with either “TRG” for target analytes or “TIC” for tentatively identified compounds or “SUR” for surrogates. When reported: Shall be present. Format: Shall be one of the following values: TRG, TIC, or SUR.

Specifications for the QA/QC File

Field	Maximum Length	Description/Domain
QC batch number	20	Laboratory number assigned by the laboratory to each batch of samples analyzed for quality control tracking purposes including laboratory internally generated QC samples When reported: Shall be present and unique within a series approved by LBNL. Format: Two unique alpha characters that the lab shall add to the front of the log number will be assigned to the lab by LBNL. This 2-letter lab code will ensure that the batch number is unique within LBNL's system. All QC batch numbers that appear in this file shall also be present in the Batch Number Reference file.
QC sample type	4	The following QC sample types are specified: BLM Method blank BS/BSD Blank spike or blank spike duplicate, prepared by non-LBNL personnel using deionized water (replaces matrix spike if not enough sample is available) LBLM Leachate method blank LCS/LCSD Lab control sample or standard, or lab control sample duplicate MS/MSD Matrix spike or matrix spike duplicate, prepared by non-LBNL personnel from a LBNL sample PDS Post-Digestion Spike REP Replicate/duplicate or split prepared by non-LBNL personnel SBLM Surrogate for the method blank SBS/SBSD Surrogate blank spike or surrogate blank spike duplicate SLCS/SLC1 Surrogate for the LCS or surrogate for the LCS duplicate SMS/SMSD Surrogate for the matrix spike or surrogate for the matrix spike duplicate SREP Surrogate for the sample replicate/duplicate Note that the results for the BS/BSD, LCS/LSCD, MS/MSD, SBS/SBSD, SLCS/SLC1 and SMS/SMSD QC sample types are reported as one row of data, not two rows. When reported: Shall be present. Format: Shall be one of the following values: BLM, BS, BSD, LCS, LCSD, LBLM, MS, MSD, PDS, REP, SBLM, SBS, SBSD, SLCS, SLC1, SMS, SMSD, SREP.
lab	10	Identifier of the analytical laboratory. When reported: Shall be present. Format: As assigned to the analytical lab by LBNL.

date sampled	11	Date sample was collected from the sampling location or date prepared for QA purposes; for example, date spike was created. For some samples this date will be the same as the analyzed date. There can be only one prepared date per QC batch number. For silica gel, use the date bubbled through the gel. When reported: Shall be present. Format: Is not case-sensitive and shall be in one of these three formats: mm/dd/yyyy (11/15/1988) dd-mmm-yyyy (15-nov-1988) mm-dd-yyyy (11-15-1988)
lower control limit	12	The value below which the data is qualified. This value is one of the laboratory's internal control limits. When reported: Shall be present for BS, BSD, LCS, LCSD, MS, MSD, PDS, SBS, SBSD, SBLM, SLCS, SLC1,SMS, SMSD and SREP sample types. Shall be blank for REP and BLM QC sample types. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the "units of result" field.
upper control limit	12	The value above which the data is qualified. This value is one of the laboratory's internal control limits. When reported: Shall be present for BS, BSD, LCS, LCSD, MS, MSD, PDS, SBS, SBSD, SBLM, SLCS, SLC1,SMS, SMSD and SREP sample types. Shall be blank for REP and BLM QC sample types. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the "units of result" field.
before concentration	12	Measured value of sample before a spike as used to calculate recovery. If no such value is used, nothing should be reported in this field. When reported: Shall be present for all non-surrogate spikes (QC sample types BS, BSD, MS, MSD, PDS). Shall be blank for all other QC sample types. For radiological analytes report the value reported in the measured concentration or activity field for the corresponding sample in the Analysis File. For chemical analytes, if detected report the value reported in the analysis result field for the corresponding sample; if non-detect, if between the Critical Level (MDL) and the CRL AND reported in the results file, report the value reported in the measured concentration or activity field; if that value is not reported, report a zero (0) in the field. Do not leave blank unless no measurement was done. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the "units of result" field.

before concentration error	12	The error will contain the two sigma total propagated uncertainty associated with the measured value for the concentration before a spike. <u>When reported:</u> Shall be present whenever before concentration is present and analyte is a radionuclide. Shall be blank for all other QC sample types. <u>Format:</u> Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field.
contract reporting limit (CRL, also CRDL and RL) for before concentration	12	The required contract reporting limit as defined by the Contract Analytical Spreadsheet for the analysis being performed. The analytical method should be able to reliably detect the presence of the analyte in the sample when the analyte is actually present in the sample at a concentration above the CRL. When reporting a “contract required detection limit” as defined by the QSAS (page 18) use this field. <u>When reported:</u> Shall be present whenever before concentration is present. <u>Format:</u> Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field
spike amount	12	Concentration appropriate for compound added to create a spike, or known certified concentration for laboratory control samples. <u>When reported:</u> Shall be present for all spikes (QC sample types BS, BSD, MS, MSD, PDS, SBLM, SBS, SBSD, ~~SLCS,~~ SMS, SMSD, SREP), and lab control samples (QC sample types LCS, LCSD, SLCS, SLC1). Shall be blank for all other QC sample types. <u>Format:</u> Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field.
reporting limit flag associated with result1	1	Used to indicate a non-detect or when an analysis result is detected but is less than the contract reporting limit of the analysis <u>When reported:</u> shall be present if result1 is less than the contract limit; otherwise optional if appropriate for the analysis. <u>Format:</u> “<“ if result1 is less than the contract reporting limit. Empty if the result for the analysis is equal to or greater than the value of the associated contract reporting limit, unless appropriate for the analysis, e.g. ignitability, which can be “>” but not “=”.

result1	12	Measured concentration or activity when a single value is appropriate, or the first analysis of replicate aliquots of a sample used to determine precision. For replicate/duplicate or split samples (REP), place the original sample measured concentration or activity, as reported in the measured concentration or activity field of the analysis file, in this field and the replicate result in result2. For chemical analytes, when the result is non-detect and measured concentration is not reported, place the contract reporting limit in this field. For surrogates (QC sample types SBLM, SBS, SBSD, SLCS, SLC1, SMS, SMSD, SREP) report percent recovery for the surrogate in this field (as well as in the percent of recovery1 field). When reported: Shall be present and shall be present if result2 is reported. Format: Numeric, in either standard or scientific notation. The number may not contain commas or alpha characters, and should only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field
error1	12	The error will contain the two sigma total propagated uncertainty associated with the measured value for result1. When reported: Shall be present if result1 is reported and data is radiological. Present if applicable for other data. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field
contract reporting limit (CRL, also CRDL and RL) for Result1	12	The required contract reporting limit as defined by the Contract Analytical Spreadsheet for the analysis being performed to obtain Result1. When the measured concentration is less than the contract reporting limit, place a “<” in the “reporting limit flag associated with result1” field. For chemical analytes, when the measured concentration is less than the contract reporting limit, also place the contract reporting limit in the result1 field. The analytical method should be able to reliably detect the presence of the analyte in the sample when the analyte is actually present in the sample at a concentration above the CRL. When reporting a “contract required detection limit” as defined by the QSAS (page 18) use this field. When reported: Shall be present if result1 is reported for a target analyte; leave blank for surrogates. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field

Percent of recovery1	10	The percentage of analyte recovered associated with Result1 calculated by the following formulas. For Lab Control Sample or Standard (LCS), the percent recovery calculation is: $$\frac{(\text{LCS concentration})*100}{\text{Spike amount}}$$ For spike recoveries, the percent recovery calculation is: $$\frac{(\text{Sample conc. with spike} - \text{Sample Conc.})*100}{\text{Spike concentration}}$$ or: $$\frac{(\text{result1} - \text{before concentration})*100}{\text{spike amount}}$$ (report the calculated value, whether positive or negative) When reported: Shall be present for QC sample types BS, BSD, LCS, LCSD, MS, MSD, PDS, SBLM, SBS, SBSD, SLCS, SLC1, SMS, SMSD and SREP QC sample types. Shall be blank for all other QC sample types. Format: Numeric, in standard notation.
result2	12	Measured concentration or activity of the second analysis of replicate aliquots used to determine precision. For chemical analytes, when the result is non-detect and measured concentration is not reported, place the contract reporting limit in this field. When reported: Shall be present for QC sample types BSD, MSD, LCSD, SBSD and SMSD, replicate/duplicate or split (REP), SLC1, and SREP and only if result1 is also reported. For surrogates (SBSD, SLC1, SMSD, SREP) report the percent recovery associated with result2 in this field. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field.
error2	12	The error will contain the two sigma total propagated uncertainty associated with the measured value for result2. When reported: Shall be present if result2 is reported and data is radiological. Present if applicable for other data. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field

contract reporting limit (CRL, also CRDL and RL) for Result2	12	The required contract reporting limit as defined by the Contract Analytical Spreadsheet for the analysis being performed to obtain Result2. When the measured concentration is less than the contract reporting limit, place the contract reporting limit in the “analysis result” field also, and place a “<” in the “reporting limit flag” field. The analytical method should be able to reliably detect the presence of the analyte in the sample when the analyte is actually present in the sample at a concentration above the CRL. When reporting a “contract required detection limit” as defined by the QSAS (page 18) use this field. When reported: Shall be present if result2 is reported for a target analyte; leave blank for surrogates. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field
Percent recovery2	10	The percentage of analyte recovered associated with Result2 calculated by the following formulas. For Lab Control Sample or Standard (LCS), the percent recovery calculation is: $\frac{\text{(LCS concentration)* 100}}{\text{Spike amount}}$ For spike recoveries, the percent recovery calculation is: $\frac{\text{(Sample conc. with spike – Sample Conc.) * 100}}{\text{Spike concentration}}$ or: $\frac{\text{(result2 – before concentration) * 100}}{\text{spike amount}}$ (report the calculated value, whether positive or negative). When reported: Shall be present for QC sample types BSD, MSD, LCSD, SBSD, SLC1, SMSD and SREP. Blank for all other QC sample types. Format: Numeric, in standard notation.
error type	1	Type of error reported (numeric or percentage) When reported: Shall be present as “P” if error reported is a percentage of the result. Blank if error is numeric.
parameter code	11	Code (assigned by LBNL) representing the analyte for which the sample is being analyzed When reported: Shall be present as supplied by LBNL. Contact the appropriate Data Manager for a new code, if none exists. Format: See Appendix A for a list of acceptable values. No other values are allowed in this field.
requested analysis	20	Code representing the analysis requested on the chain of custody (COC) for which the QA/QC sample is being run When reported: Shall be present. Format: Identical as supplied by LBNL For valid value list see Contract Analytical Spreadsheet.
sample matrix	2	The medium of the sample or BW for method blank or laboratory control sample if it is aqueous or SO for method blank or laboratory control sample if it is soil When reported: Shall be present Format: Identical as supplied by LBNL when supplied or as provided and mutually accepted by the lab and LBNL. See Appendix B for allowable values.

<table>
<tr><td>percent relative difference</td><td>10</td><td>Calculated using the following: $\frac{\lvert R1-R2\rvert * 100}{(R1+R2) / 2}$
where R1 is the result1 and R2 is the result2. Report only when R1 and R2 are positive (for chemical analytes, report only when result1 and result 2 are both detect)
<u>When reported:</u>
Radiological analytes: shall be present for QA sample types BSD, MSD, and REP. Shall be present for LCSD samples if Result2 was reported. May be reported but not required for surrogates (SBSD, SLC1, SMSD, SREP). Blank for all other QA sample types.
Chemical analytes: as above, when both results are detect. Blank otherwise.
<u>Format:</u> Numeric, in standard notation only.</td></tr>
<tr><td>units of result</td><td>10</td><td>The units in which the analysis spike amount, result1, result2, error1, error2 and all detection limits are represented
<u>When reported:</u> Shall be present and the same for all concentrations or activities reported.
<u>Format:</u> Can include any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), backslash (\), pound sign (#), single quote (‘), double quote (“), and vertical bar (|).</td></tr>
<tr><td>analysis method</td><td>20</td><td>The EPA method or equivalent details of the method of analysis
<u>When reported</u>: Shall be present.
<u>Format:</u> Can include any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), vertical bar (|), backslash (\), pound sign (#), single quote (‘), and double quote (“).</td></tr>
<tr><td>date/time analyzed</td><td>19</td><td>Date analysis took place.
<u>When reported:</u> Shall be present.
<u>Format:</u> Is not case-sensitive and the following format is preferred:
mm/dd/yyyy hh24:mi:ss, where
mm = month 01-12
dd = day 1-31
yyyy = year
hh24 = hour specified as 01-24
mi = minutes 01-59
ss = seconds
Report 0s for hours, minutes, seconds if not applicable. Other formats may be acceptable if agreed to by LBNL.</td></tr>
<tr><td>extraction method</td><td>20</td><td>The identification of the method used to extract the compound for analysis
<u>When reported:</u> Shall be present if applicable.
<u>Format:</u> Identical as supplied by LBNL if supplied. Any characters excluding asterisk(*), question mark(?), comma(,), percent(%), underscore(_), backslash (\), pound sign (#), single quote (‘), double quote(“), and vertical bar(|).</td></tr>
<tr><td>extraction date</td><td>11</td><td>Date extraction took place, if appropriate
<u>When reported:</u> Shall be present if appropriate.
<u>Format:</u> Is not case-sensitive and shall be in one of these three formats:
mm/dd/yyyy (11/15/1988)
dd-mmm-yyyy (15-nov-1988)
mm-dd-yyyy (11-15-1988)</td></tr>
</table>

instrument ID	6	Identifying code of the instrument used for analysis When reported: Shall be present. Format: Can include any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), backslash (\), pound sign (#), single quote (‘), double quote (“), and vertical bar (|).
analyst ID	6	Identifying code of the analyst at the analytical lab When reported: Shall be present Format: Can include any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), backslash (\), pound sign (#), single quote (‘), double quote (“), and vertical bar (|).
comments	100	Any comments When reported: Shall be present when applicable Format: Can include any characters excluding asterisk (*), question mark (?), comma (,), percent (%), underscore (_), backslash (\), pound sign (#), single quote (‘), double quote (“), and vertical bar (|).
relative difference control limit	10	If the relative difference is above this value, the data should be qualified. This value is one of the laboratory’s internal control limits. When reported: Shall be present whenever “percent relative difference” field is not blank (required for BSD, MSD and REP QC sample types, required for LCSD~~/SLCS~~ QC sample type if result2 is reported). Format: Numeric, in standard notation only. Must be positive.
relative error ratio (RER)	12	Calculated using the following: RER = |R1-R2|/(S1+S2) where R1 is the result1, R2 is the result2, S1 and S2 are the same values as reported in the error1 and error2 fields. The uncertainties used to calculate S1 and S2 shall be in the same units of measurement as R1 and R2 (not percent uncertainty). Pairs of results having a RER greater than 1 should be investigated and explained in the case narrative. When reported: Shall be present when the analyte is radiological and result1, result2, error1 and error2 are reported. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125.
detectable level (DL, also MDC, LD) associated with Result1	12	Use this field when reporting a “minimum detectable concentration” as defined by the QSAS pages 14, D-37 through D-41. Use one of formulas on pages D-37 through D-41 of the QSAS, as appropriate, unless prior approval for a project-specific exception has been obtained. Leave this field blank when reporting results for analytical methods that do not have an MDC associated with them. The detectable level is the lowest concentration at or above which an analyte can confidently be detected (i.e., distinguished from zero). That is, when the true concentration is at or above DL, the measured concentration is highly likely to exceed the CL. Failures to detect the analyte should be rare when the true concentration is at or above the DL. When reported: Shall be present for radiological analyses, blank unless specifically requested for chemical analyses. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field.

Specifications for the QA/QC File(continued)

detectable level (DL, also MDC, LD) associated with result2	12	Use this field when reporting a “minimum detectable concentration” as defined by the pages 14, D-37 through D-41. Use one of formulas on pages D-37 through D-41 of the QSAS, as appropriate, unless prior approval for a project-specific exception has been obtained. Leave this field blank when reporting results for analytical methods that do not have an MDC associated with them. The detectable level is the lowest concentration at or above which an analyte can confidently be detected (i.e., distinguished from zero). That is, when the true concentration is at or above DL, the measured concentration is highly likely to exceed the CL. Failures to detect the analyte should be rare when the true concentration is at or above the DL. When reported: Shall be present for radiological analyses when result2 is reported, blank unless specifically requested for chemical analyses. Format: Numeric, in either standard or scientific notation. The number may not contain commas, and only include significant digits with a precision of 12 or fewer digits. If scientific notation is used, it shall be in the format sn.dEsd where each s may be "+", "-", or omitted, n represents a digit, and each d represents one or more digits. The range of n.dEsd is 1.0E-130 to 9.9999E125. Units: as reported in the “units of result” field.
reporting limit flag associated with result2	1	Used to indicate a non-detect or when an analysis result is detected but is less than the contract reporting limit of the analysis When reported: shall be present if result2 is less than the contract limit; otherwise optional if appropriate for the analysis. Format: “<“ if result1 is less than the contract reporting limit. Empty if the result for the analysis is equal to or greater than the value of the associated contract reporting limit, unless appropriate for the analysis, e.g. ignitability, which can be “>” but not “=”.

Specifications for Batch Number Reference File

Field	Maximum Length	Description/Domain
QC batch number	20	Laboratory number assigned by the laboratory to each batch of samples analyzed for quality control tracking purposes including laboratory internally generated QC samples. For every log number in the sample file, there shall be a row in this file if there is QA/QC data associated with it. When reported: Shall be present and unique within a series approved by LBNL. Format: Two unique alpha characters that the lab shall add to the front of the log number will be assigned to the lab by LBNL. This 2-letter lab code will ensure that the batch number is unique within LBNL's system. All QC batch numbers that appear in this file shall also be present in the QA/QC file.
log number	12	Analytical lab's unique log number used as the identifier of a sample taken by LBNL When reported: Shall be present. Format: Shall be identical to log number sent with analytical results via regular electronic data transmittal. A unique pair of alpha characters that the lab shall add to the front of the log number will be assigned to the lab by LBNL ensuring that the log number is unique within LBNL's system.

Specifications for Text File

Text file. This file shall contain information relevant to the analysis, which is not included in the other EDD files. Report case narrative or other qualifying information here. Information that links data in this file to the results to which they apply shall be included. Format: plain text only; special formatting (underlining, etc.) or special characters (i.e. asterisk (*), question mark (?), percent (%), underscore (_), vertical bar (|), backslash (\), single quote (‘), double quote (“), and pound sign (#)) are not allowed. No maximum length. Other file formats (e.g., doc, rtf, pdf, etc.) may be uploaded only with prior permission from the LBNL group requesting the work, and if the file format is anything other than plain-text, this must be noted in the “Optional Comments” field on the final screen of the data upload website during upload.

Checks to be Performed on Analytical Data Before Transfer to LBNL

ALL ELECTRONIC DATA MUST MATCH DATA REPORTED ON HARDCOPY.

These checks for erroneous conditions will be programmatically performed on data received at LBNL from outside laboratories. At minimum, these same checks are to be performed via program code at the outside laboratory to insure that none of the conditions exist just before the data is sent to LBNL.

The following checks shall be performed on the sample file:

- null or blank log number
- two or more records for same log number
- no analysis data for a log number
- null or blank date sampled
- null or blank requester name
- null or blank lab name
- null or blank sampling location

The following checks shall be performed on the analysis file:

- null or blank log number
- no sample file record matching this log number
- invalid or null parameter code
- two or more records with same log number, parameter code, and requested analysis
- Reporting limit flag indicator shall be equal to “<”, “>”, or be empty
- null or blank units
- null or blank date analyzed
- null or blank requested analysis
- contract reporting limit (CRL) less than or equal to zero
- error less than zero
- reporting limit flag not equal to “<” when measured concentration or activity is less than or equal to the contract reporting limit (CRL)
- result not equal to contract reporting limit (CRL) when measured concentration or activity is less than or equal to contract reporting limit (CRL)
- result not equal to measured concentration or activity when measured concentration or activity is greater than contract reporting limit (CRL)

The following checks shall be performed on the QA/QC file:

- null or blank batch number
- two or more record with same QC batch number and QC sample type
- null or blank date sampled
- null or blank requested analysis
- null or blank lab name
- invalid or null parameter code
- two or more records with same QC batch number, sample type, analyte, and requested analysis
- reporting limit flag shall be equal to “<”, “>”, or be empty
- null or blank units
- null or blank date analyzed
- contract reporting limit (CRL) value less than or equal to zero
- reporting limit flag not equal to “<” when measured concentration or activity is less than the contract reporting limit
- null or non-zero relative difference control limit when RPD is reported

The following checks shall be performed on the batch number reference file:

- null or blank batch number
- null or blank log number
- two or more records with same QC batch number and log number

Appendix A - Codes of Parameters

List of Parameter Codes
See AppendixA.xls

Appendix B - Matrix Codes

Analysis	Analyte	Parameter Code
PCB:Congeners	13C-labeled PCB-1	12001
PCB:Congeners	13C-labeled PCB-101	12101
PCB:Congeners	13C-labeled PCB-104	12104
PCB:Congeners	13C-labeled PCB-105	12105
PCB:Congeners	13C-labeled PCB-11	12011
PCB:Congeners	13C-labeled PCB-114	12114
PCB:Congeners	13C-labeled PCB-118	12118
PCB:Congeners	13C-labeled PCB-123	12123
PCB:Congeners	13C-labeled PCB-126	12126
PCB:Congeners	13C-labeled PCB-127	12127
PCB:Congeners	13C-labeled PCB-138	12138
PCB:Congeners	13C-labeled PCB-141	12141
PCB:Congeners	13C-labeled PCB-153	12153
PCB:Congeners	13C-labeled PCB-155	12155
PCB:Congeners	13C-labeled PCB-156	12156
PCB:Congeners	13C-labeled PCB-157	12157
PCB:Congeners	13C-labeled PCB-159	12159
PCB:Congeners	13C-labeled PCB-167	12167
PCB:Congeners	13C-labeled PCB-169	12169
PCB:Congeners	13C-labeled PCB-170	12170
PCB:Congeners	13C-labeled PCB-178	12178
PCB:Congeners	13C-labeled PCB-180	12180
PCB:Congeners	13C-labeled PCB-188	12188
PCB:Congeners	13C-labeled PCB-189	12189
PCB:Congeners	13C-labeled PCB-19	12019
PCB:Congeners	13C-labeled PCB-194	12194
PCB:Congeners	13C-labeled PCB-202	12202
PCB:Congeners	13C-labeled PCB-206	12206
PCB:Congeners	13C-labeled PCB-208	12208
PCB:Congeners	13C-labeled PCB-209	12209
PCB:Congeners	13C-labeled PCB-28	12028
PCB:Congeners	13C-labeled PCB-3	12003
PCB:Congeners	13C-labeled PCB-32	12032
PCB:Congeners	13C-labeled PCB-37	12037
PCB:Congeners	13C-labeled PCB-4	12004
PCB:Congeners	13C-labeled PCB-47	12047
PCB:Congeners	13C-labeled PCB-52	12052
PCB:Congeners	13C-labeled PCB-54	12054
PCB:Congeners	13C-labeled PCB-70	12070
PCB:Congeners	13C-labeled PCB-77	12077
PCB:Congeners	13C-labeled PCB-79	12079
PCB:Congeners	13C-labeled PCB-80	12080
PCB:Congeners	13C-labeled PCB-81	12081
PCB:Congeners	13C-labeled PCB-9	12009
PCB:Congeners	13C-labeled PCB-95	12095
PCB:Congeners	13C-labeled PCB-97	12097

Analysis	Analyte	Parameter Code
PCB:Congeners	59 PCB Congener Summation	12210
PCB:Congeners	PCB 001	10001
PCB:Congeners	PCB 002	10002
PCB:Congeners	PCB 003	10003
PCB:Congeners	PCB 006	10006
PCB:Congeners	PCB 011	10011
PCB:Congeners	PCB 014	10014
PCB:Congeners	PCB 015	10015
PCB:Congeners	PCB 017	10017
PCB:Congeners	PCB 018	10018
PCB:Congeners	PCB 019	10019
PCB:Congeners	PCB 022	10022
PCB:Congeners	PCB 023	10023
PCB:Congeners	PCB 025	10025
PCB:Congeners	PCB 026	10026
PCB:Congeners	PCB 028	10028
PCB:Congeners	PCB 029	10029
PCB:Congeners	PCB 030	10030
PCB:Congeners	PCB 031	10031
PCB:Congeners	PCB 034	10034
PCB:Congeners	PCB 035	10035
PCB:Congeners	PCB 036	10036
PCB:Congeners	PCB 037	10037
PCB:Congeners	PCB 038	10038
PCB:Congeners	PCB 039	10039
PCB:Congeners	PCB 040	10040
PCB:Congeners	PCB 044	10044
PCB:Congeners	PCB 045	10045
PCB:Congeners	PCB 046	10046
PCB:Congeners	PCB 047	10047
PCB:Congeners	PCB 050	10050
PCB:Congeners	PCB 051	10051
PCB:Congeners	PCB 053	10053
PCB:Congeners	PCB 054	10054
PCB:Congeners	PCB 055	10055
PCB:Congeners	PCB 057	10057
PCB:Congeners	PCB 058	10058
PCB:Congeners	PCB 062	10062
PCB:Congeners	PCB 063	10063
PCB:Congeners	PCB 065	10065
PCB:Congeners	PCB 067	10067
PCB:Congeners	PCB 068	10068
PCB:Congeners	PCB 073	10073
PCB:Congeners	PCB 074	10074
PCB:Congeners	PCB 077	10077

Analysis	Analyte	Parameter Code
PCB:Congeners	PCB 078	10078
PCB:Congeners	PCB 079	10079
PCB:Congeners	PCB 080	10080
PCB:Congeners	PCB 081	10081
PCB:Congeners	PCB 082	10082
PCB:Congeners	PCB 083	10083
PCB:Congeners	PCB 086	10086
PCB:Congeners	PCB 089	10089
PCB:Congeners	PCB 093	10093
PCB:Congeners	PCB 094	10094
PCB:Congeners	PCB 096	10096
PCB:Congeners	PCB 097	10097
PCB:Congeners	PCB 099	10099
PCB:Congeners	PCB 100	10100
PCB:Congeners	PCB 103	10103
PCB:Congeners	PCB 104	10104
PCB:Congeners	PCB 105	10105
PCB:Congeners	PCB 110	10110
PCB:Congeners	PCB 113	10113
PCB:Congeners	PCB 114	10114
PCB:Congeners	PCB 119	10119
PCB:Congeners	PCB 120	10120
PCB:Congeners	PCB 121	10121
PCB:Congeners	PCB 122	10122
PCB:Congeners	PCB 123	10123
PCB:Congeners	PCB 124	10124
PCB:Congeners	PCB 126	10126
PCB:Congeners	PCB 127	10127
PCB:Congeners	PCB 129	10129
PCB:Congeners	PCB 130	10130
PCB:Congeners	PCB 131	10131
PCB:Congeners	PCB 135	10135
PCB:Congeners	PCB 136	10136
PCB:Congeners	PCB 137	10137
PCB:Congeners	PCB 140	10140
PCB:Congeners	PCB 141	10141
PCB:Congeners	PCB 144	10144
PCB:Congeners	PCB 145	10145
PCB:Congeners	PCB 147	10147
PCB:Congeners	PCB 148	10148
PCB:Congeners	PCB 150	10150
PCB:Congeners	PCB 151	10151
PCB:Congeners	PCB 152	10152
PCB:Congeners	PCB 153	10153
PCB:Congeners	PCB 154	10154
PCB:Congeners	PCB 155	10155

Analysis	Analyte	Parameter Code
PCB:Congeners	PCB 156	10156
PCB:Congeners	PCB 157	10157
PCB:Congeners	PCB 159	10159
PCB:Congeners	PCB 166	10166
PCB:Congeners	PCB 167	10167
PCB:Congeners	PCB 168	10168
PCB:Congeners	PCB 169	10169
PCB:Congeners	PCB 170	10170
PCB:Congeners	PCB 171	10171
PCB:Congeners	PCB 172	10172
PCB:Congeners	PCB 173	10173
PCB:Congeners	PCB 174	10174
PCB:Congeners	PCB 175	10175
PCB:Congeners	PCB 176	10176
PCB:Congeners	PCB 177	10177
PCB:Congeners	PCB 178	10178
PCB:Congeners	PCB 179	10179
PCB:Congeners	PCB 180	10180
PCB:Congeners	PCB 181	10181
PCB:Congeners	PCB 183	10183
PCB:Congeners	PCB 184	10184
PCB:Congeners	PCB 185	10185
PCB:Congeners	PCB 186	10186
PCB:Congeners	PCB 188	10188
PCB:Congeners	PCB 189	10189
PCB:Congeners	PCB 190	10190
PCB:Congeners	PCB 191	10191
PCB:Congeners	PCB 192	10192
PCB:Congeners	PCB 193	10193
PCB:Congeners	PCB 194	10194
PCB:Congeners	PCB 195	10195
PCB:Congeners	PCB 197	10197
PCB:Congeners	PCB 198	10198
PCB:Congeners	PCB 199	10199
PCB:Congeners	PCB 200	10200
PCB:Congeners	PCB 201	10201
PCB:Congeners	PCB 202	10202
PCB:Congeners	PCB 204	10204
PCB:Congeners	PCB 205	10205
PCB:Congeners	PCB 206	10206
PCB:Congeners	PCB 207	10207
PCB:Congeners	PCB 208	10208
PCB:Congeners	PCB 209	10209
PCB:Congeners	PCB-106/118 co-eluter	11106
PCB:Congeners	PCB-107/109 co-eluter	11107
PCB:Congeners	PCB-108/112 co-eluter	11108

Analysis	Analyte	Parameter Code
PCB:Congeners	PCB-111/115 co-eluter	11111
PCB:Congeners	PCB-12/13 co-eluter	11012
PCB:Congeners	PCB-128/162 co-eluter	11128
PCB:Congeners	PCB-132/161 co-eluter	11132
PCB:Congeners	PCB-133/142 co-eluter	11133
PCB:Congeners	PCB-134/143 co-eluter	11134
PCB:Congeners	PCB-138/163/164 co-eluter	11138
PCB:Congeners	PCB-139/149 co-eluter	11139
PCB:Congeners	PCB-146/165 co-eluter	11146
PCB:Congeners	PCB-158/160 co-eluter	11158
PCB:Congeners	PCB-16/32 co-eluter	11016
PCB:Congeners	PCB-182/187 co-eluter	11182
PCB:Congeners	PCB-196/203 co-eluter	11196
PCB:Congeners	PCB-20/21/33 co-eluter	11020
PCB:Congeners	PCB-24/27 co-eluter	11024
PCB:Congeners	PCB-4/10 co-eluter	11004
PCB:Congeners	PCB-41/64/71/72 co-eluter	11041
PCB:Congeners	PCB-42/59 co-eluter	11042
PCB:Congeners	PCB-43/49 co-eluter	11043
PCB:Congeners	PCB-48/75 co-eluter	11048
PCB:Congeners	PCB-5/8 co-eluter	11005
PCB:Congeners	PCB-52/69 co-eluter	11052
PCB:Congeners	PCB-56/60 co-eluter	11056
PCB:Congeners	PCB-61/70 co-eluter	11061
PCB:Congeners	PCB-7/9 co-eluter	11007
PCB:Congeners	PCB-76/66 co-eluter	11076
PCB:Congeners	PCB-84/92 co-eluter	11084
PCB:Congeners	PCB-85/116 co-eluter	11085
PCB:Congeners	PCB-87/117/125 co-eluter	11087
PCB:Congeners	PCB-88/91 co-eluter	11088
PCB:Congeners	PCB-90/101 co-eluter	11090
PCB:Congeners	PCB-95/98/102 co-eluter	11095

List of Matrix Codes
See AppendixB.xls

MATRIX	DESCRIPTION
AB	Alpha Beta Background Low Vol Air Particulate
AF	air filter
AQ	aqueous: water modified in any manner from ground water, including treatment, passing through a pipe, or a borehole sampled with a bailer. All treatment facility sample ports are aqueous.
AS	asphalt
AT	air tritium
BF	backfill
BW	blank water
CH	charcoal
CO	concrete
CV	condensed vapor sample
DF	drilling fluid
DS	dosimeter
DW	drinking water
GR	gravel
GW	ground water: water from a single developed well, unaltered by sampling method or treatment. Spring samples are also ground water.
HY	honey
LI	liquid, nonaqueous
ML	milk
OL	oil
OR	organics
OS	solvents/oils
OT	other
PD	pad from Seamist soil vapor monitoring
PS	solvents/paints
PW	processed waste water
RA	rain
RM	roof material
RO	storm water runoff
RT	retention tank liquid
SL	sludge, liquid
SO	soil or sediment
SS	sludge, solid
SW	sewer effluent
TW	cooling tower water
VA	vapor or air
VB	vapor blank
VG	vegetation
WA	waste, solid
WI	wine
WP	sampling wipe
WW	wastewater
BR	brick

Appendix C - Reporting convention description

The following language is a clarification of how the “analysis result” field should be filled in the EDD. These are *not new*; but just a re-wording of existing definitions, in the hopes that it will be clearer.

The fields involved are the “analysis result”, “measured concentration or activity”, “contract reporting limit” and “reporting limit flag” fields.

The term “measured concentration or activity” refers to a number representing the actual measured concentration or activity, regardless of whether it is less than or greater than any of the various kinds of detection limits, regardless of whether it is positive or negative, and regardless of whether the measurement uncertainty is large or small. Although non-radiological methods do no normally *report* any such number, these rules are written as if such a number is available to the lab, even if not reported (i.e., the measurement process produces a number, even if the number is so close to zero as to be considered most likely a result of instrumental noise). Radiological results are reported as activity *per unit mass or volume*, so the term “concentration” is appropriate for both radiological and non-radiological analyses.

Reporting rules:

- In all cases, place the contract reporting limit in the “contract reporting limit” field.

Rules for the “measured concentration or activity” field

- For all analyses of radionuclides, always place the measured activity in the “measured concentration or activity” field.
- For certain projects with special reporting requirements for non-radiological analyses, if the measured concentration is between the method detection limit (MDL) and the contract reporting limit, place the measured concentration in the “measured concentration or activity” field.
- For non-radiological analyses, when the measured concentration is greater than or equal to the contract reporting limit, place the measured concentration in the “measured concentration or activity” field.
- Otherwise leave the “measured concentration or activity” field empty.

Rules for the “analysis result” and “reporting limit flag” fields

- When the measured concentration or activity is greater than or equal to the contract reporting limit, place the measured concentration or activity in the “analysis result” field. Leave the “reporting limit flag” field empty (exception: if appropriate place a “>” sign in the “reporting limit flag” field for certain analytical methods, e.g., ignitability).
- When the measured concentration or activity is less than the contract reporting limit, place the contract reporting limit in the “analysis result” field and place a “<” in the “reporting limit flag” field.

Rule when numerical value not available

- When an analytical method does not provide a numerical value (i.e., for extremely low levels or non-detections), leave the “measured concentration or activity” field empty. Place the contract reporting limit in the “analytical result” field and a “<” sign in the “reporting limit flag” field.

Transfer Instructions to LBNL

Uploading Electronic Data Deliverables (EDDs) to Lawrence Berkeley National Laboratory (LBNL) users

LBNL maintains a secure website for analytical laboratories to upload EDDs. Prior to first use, laboratory representatives must contact Steve Wyrick, LBNL Environment, Health & Safety Division, at 510-486-6903 or sjwyrick@lbl.gov to obtain a laboratory user account and passwords. One account is assigned per analytical laboratory; individual users are not assigned separate accounts. Each user account has multiple passwords which correspond to the individual LBNL user groups.

The LBNL Data Upload website is located at http://ehswprod.lbl.gov/DataUpload/; it is compatible with Mozilla, Netscape and Internet Explorer. Users log in with their laboratory's user name, the password corresponding to the LBNL user group to which the EDD is being uploaded, and the LBNL chain-of-custody number. If the EDD represents a reanalysis, enter the letter corresponding to the number of the reanalysis ('a' for the 1st reanalysis, 'b' for the 2nd, etc.); leave this field blank for the initial data set (Figures 1 and 2).

Figure 1.

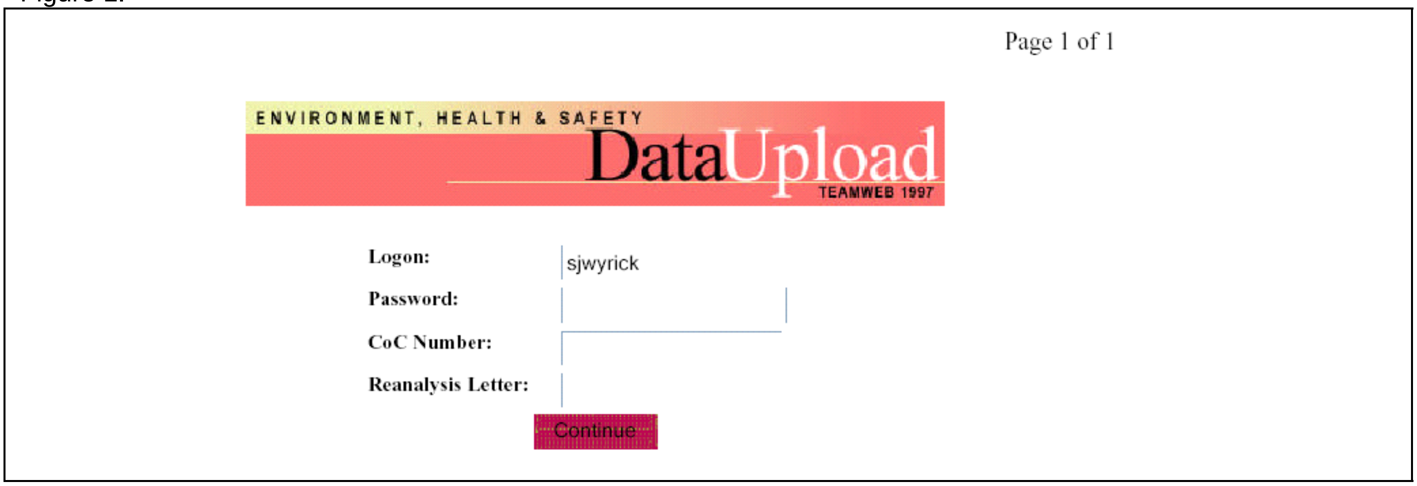
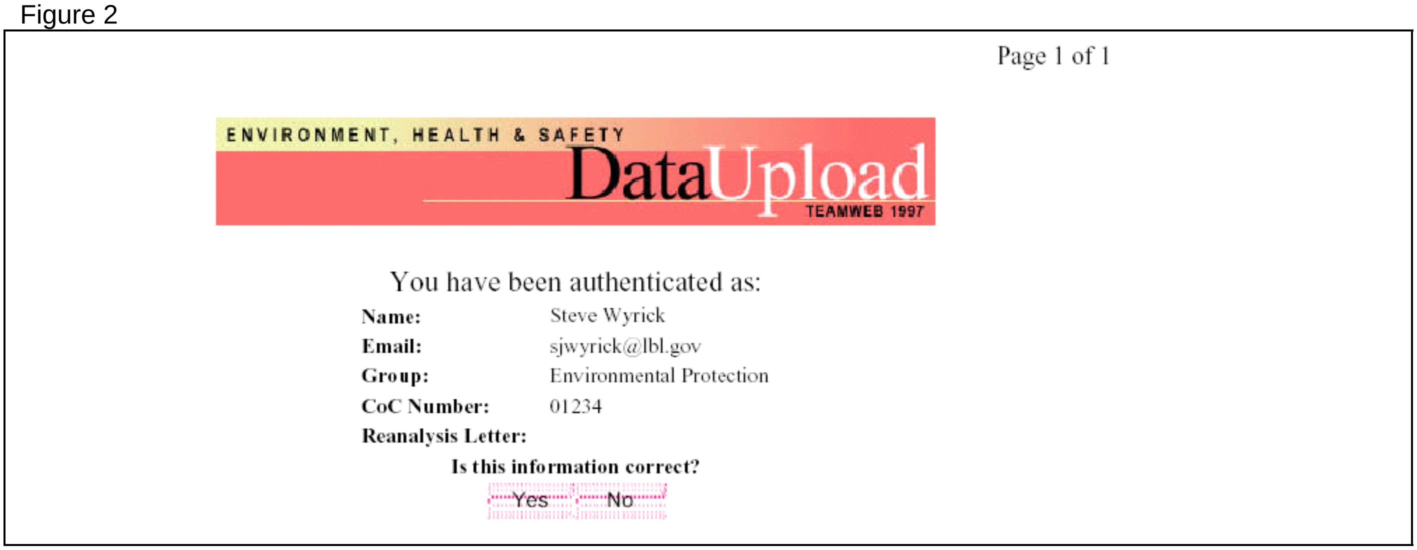
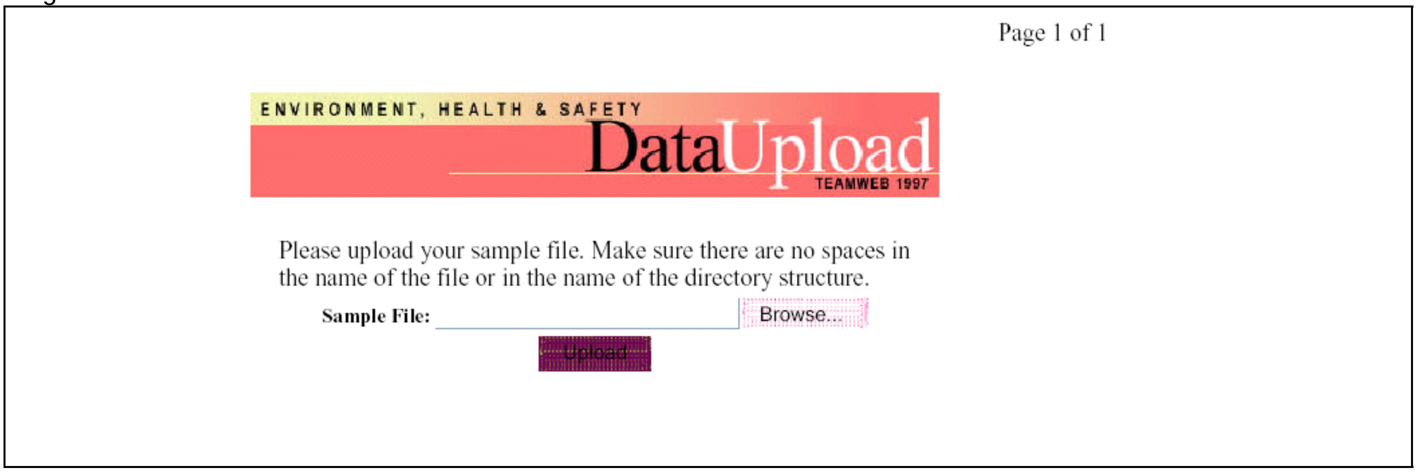


Figure 2



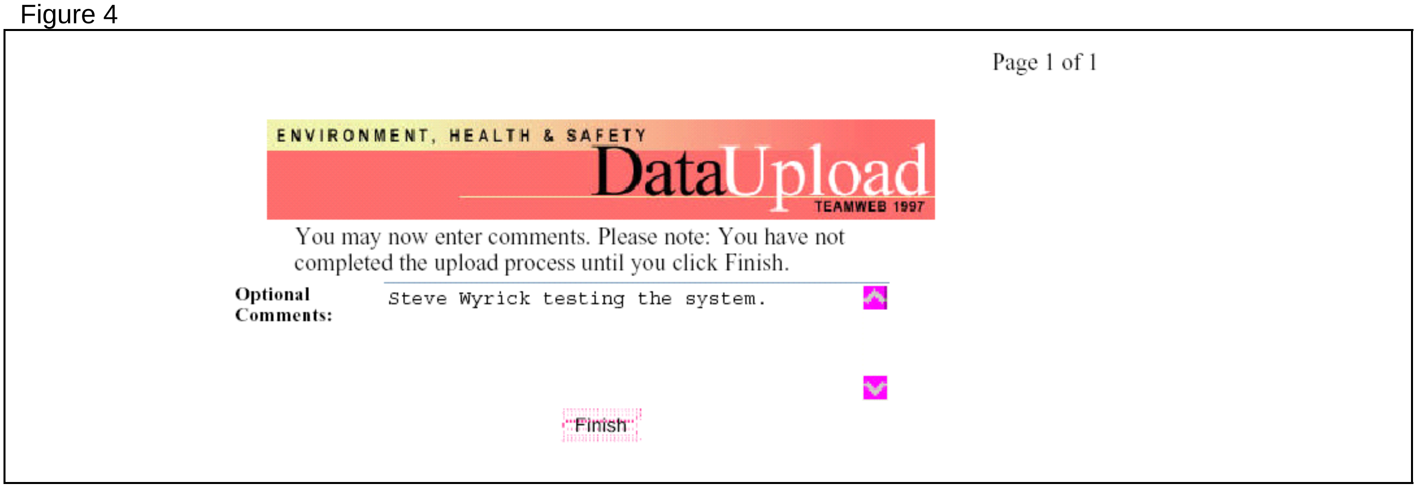
The website then prompts the user to browse their computer or network to locate and upload the analysis results file (.ana), quality control results file (.qac), mapping file (.ref), sample file (.sam), and optional text (.txt) file (Figure 3). Files are not required to have these extensions initially; the correct file names and extensions are appended when the files are uploaded to the website.

Figure 3.



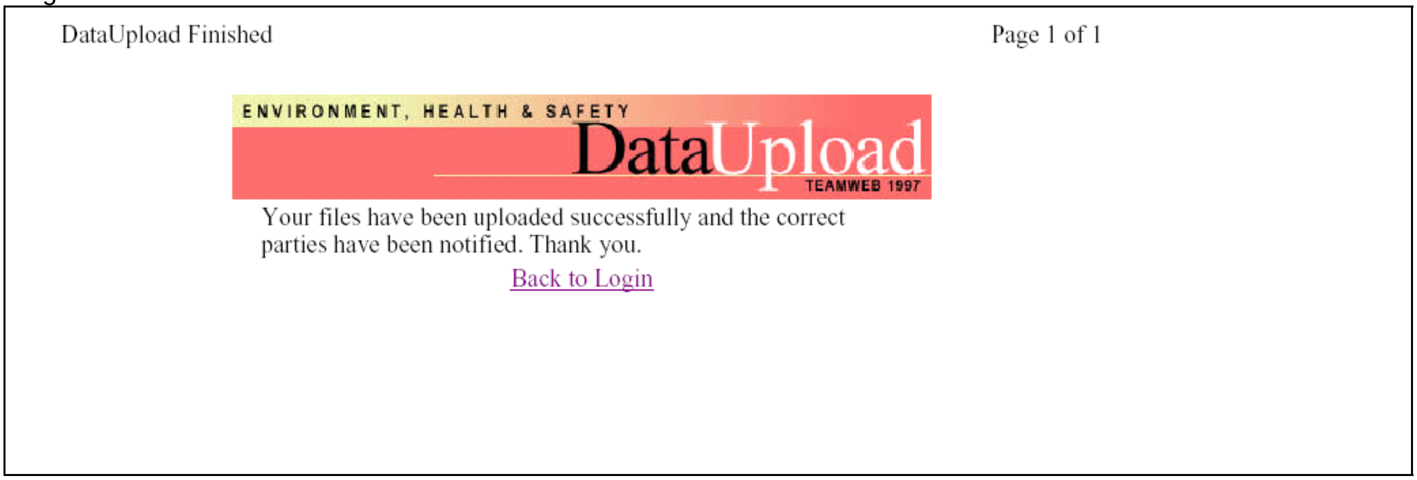
Finally the website provides an area to enter comments about the batch that will appear on an e-mail message sent to the LBNL user group's data manager (Figure 4).

Figure 4



Clicking on the ‘finish’ button completes the uploading process by sending an e-mail to the LBNL data manager to alert her/him that the files have been uploaded and are available for download from the website. Once the final screen appears signaling that files have been uploaded successfully (Figure 5) the upload process is complete.

Figure 5



Please address all questions and problems regarding the website or the data upload process to Steve Wyrick (see contact information at the beginning of this section).